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A WAYNE GREEN PUBLICATION



Get Down to BUSINESS

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11/81

New Instant Software Catalog

#23



The Micro Connection

DOSPLUS

FEATURES:

- 1) Radio Shack compatibility
- 2) Error free variable length records
- 3) Full lower case detection and support
- 4) Repeating keyboard with NO keybounce EVER
- 5) Shift [0] typewriter keyboard option
- 6) Execute only protection feature for BASIC programs
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- 8) Device I/O handling with FORCE command
- 9) Supports high speed clock modification (up to 4.0mhz)
- 10) Supports mixed mode (single & double density) automatically
- 11) Allows disable-enable of 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
- 15) Multiple command chaining with "DO"
- 16) Built in memory test with CLEAR command
- 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 DISKUMD/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)

New DOSPLUS Z80 Extended Disk BASIC

- 1) Faster loads and saves
- 2) BASIC Reference utility (lines, variables, keywords, printer option)
- 3) BASIC Renumber utility (renumber section of text, block text move)
- 4) Shorthand features for almost ANY direct command (LOAD, SAVE, etc.)
- 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 variables)
- 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 8K of RAM (40K left in 48K TRS-80)

***** 7 MORE UTILITIES *****

- 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)
- 6) Spooler (allows printing of text while freeing up the CPU)
- 7) Crunch (Basic program compressor)

***** ALSO *****

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DOSPLUS gives you more of what you buy an operating system for. Speed and reliability without sacrificing simplicity and power. If you need extra power without extra wait, then you need DOSPLUS!

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(Model III DOSPLUS review)

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Percom's DOUBLER II* tolerates wide variations in media, drives

GARLAND, TEXAS — May 22, 1981 — Harold Mauch, president of Percom Data Company, announced here today that an improved version of the Company's innovative DOUBLER™ adapter, a double-density plug-in module for TRS-80* Model I computers, is now available.

Reflecting design refinements based on both theoretical analyses and field testing, the DOUBLER II™, so named, permits even greater tolerance in variations among media and drives than the previous design.

Like the original DOUBLER, the DOUBLER II plugs into the drive controller IC socket of a TRS-80 Model I Expansion Interface and permits a user to run either single- or double-density diskettes on a Model I.

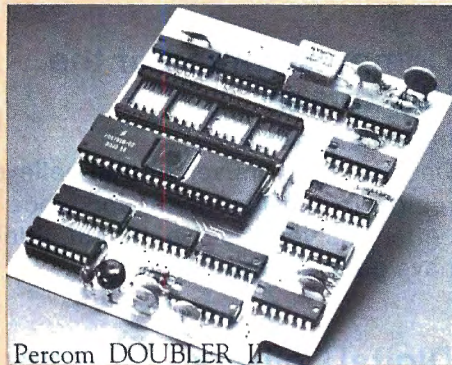
With a DOUBLER II installed, over four times more formatted data — as much as 364 Kbytes — can be stored on one side of a five-inch diskette than can be stored using a standard Tandy Model I drive system.

Moreover, a DOUBLER II equips a Model I with the hardware required to run Model III diskettes.

(Ed. Note: See "OS-80™: Bridging the TRS-80* software compatibility gap" elsewhere on this page.)

The critical clock-data separation circuitry of the DOUBLER II is a proprietary design called a ROM-programmed digital phase-lock loop data separator.

According to Mauch, this design is more tolerant of differences from diskette to diskette and drive to drive, and also provides immunity to performance degradation caused by circuit component aging.



Percom DOUBLER II

Mauch said "A DOUBLER II will operate just as reliably two years after it is installed as it will two days after installation."

The digital phase-lock loop also eliminates the need for trimmer adjustments typical of analog phase-lock loop circuits.

"You plug in a Percom DOUBLER II and then forget it," he said.

The DOUBLER II also features a refined Write Precompensation circuit that more effectively minimizes the phenomena of bit- and peak-shifting, a reliability-impairing characteristic of magnetic data recording.

The DOUBLER II, which is fully software compatible with the previous DOUBLER, is supplied with DBLDOS™, a TRSDOS*-compatible disk operating system.

The DOUBLER II sells for ~~\$219.95~~, including the DBLDOS diskette.

Now \$169.95!

Circuit misapplication causes diskette read, format problems. High resolution key to reliable data separation

GARLAND, TEXAS — The Percom SEPARATOR™ does very well for the Radio Shack TRS-80* Model I computer what the Tandy disk controller does poorly at best: reliably separates clock and data signals during disk-read operations.

Unreliable data-clock separation causes format verification failures and repeated read retries.

CRC ERROR—TRACK LOCKED OUT

The problem is most severe on high-number (high-density) inner file tracks.

As reported earlier, the clock-data separation problem was traced by Percom to misapplication of the internal separator of the 1771 drive controller IC used in the Model I.

The Percom Separator substitutes a high-resolution digital data separator circuit, one which operates at 16 megahertz, for the low-resolution one-megahertz circuit of the Tandy design.

Separator circuits that operate at lower frequencies — for example, two- or four-

megahertz — were found by Percom to provide only marginally improved performance over the original Tandy circuit.

The Percom solution is a simple adapter that plugs into the drive controller of the Expansion Interface (EI).

Not a kit — some vendors supply an untested separator kit of resistors, ICs and other paraphernalia that may be installed by modifying the computer — the Percom SEPARATOR is a fully assembled, fully tested plug-in module.

Installation involves merely plugging the SEPARATOR into the Model I EI disk controller chip socket, and plugging the controller chip into a socket on the SEPARATOR.

The SEPARATOR, which sells for only \$29.95, may be purchased from authorized Percom retailers or ordered directly from the factory. The factory toll-free order number is 1-800-527-1222.

Ed. note: Opening the TRS-80 Expansion Interface may void the Tandy limited 90-day warranty.

Owners of original DOUBLERs may purchase a DOUBLER II upgrade kit, without the disk controller IC, for \$30.00. Proof of purchase of an original DOUBLER is required, and each DOUBLER owner may purchase only one DOUBLER II at the \$30.00 price.

The Percom DOUBLER II is available from authorized Percom retailers, or may be ordered direct from the factory. The factory toll-free order number is 1-800-527-1222.

Ed. note: Opening the TRS-80 Expansion Interface may void the Tandy limited 90-day warranty.

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All that glitters is not gold OS-80™ Bridging the TRS-80* software compatibility gap

Compatibility between TRS-80* Model I diskettes and the new Model III is about as genuine as a gold-plated lead Kruggerand.

True, Model I TRSDOS* diskettes can be read on a Model III. But first they must be converted and re-recorded for Model III operation.

And you cannot write to a Model I TRSDOS* diskette. Not with a Model III. You cannot add a file. Delete a file. Or in any way modify a Model I TRSDOS diskette with a Model III computer.

Furthermore, your converted TRSDOS diskettes cannot be converted back for Model I operation.

TRSDOS is a one-way street. And there's no retreating. A point to consider before switching the company's payroll to your new Model III.

Real software compatibility should allow the direct, immediate interchangeability of Model I and Model III diskettes. No read-only limitations, no conversion/re-recording steps and no chance to be left high and dry with Model III diskettes that can't be run on a Model I.

What's the answer? The answer is Percom's OS-80™ family of TRS-80 disk operating systems.

OS-80 programs allow direct, immediate interchangeability of Model I and Model III diskettes.

You can run Model I single-density diskettes on a Model III; install Percom's plug-in DOUBLER™ adapter in your Model I, and you can run double-density Model III diskettes on a Model I.

There's no conversion, no re-recording. Slip an OS-80 diskette out of your Model I and insert it directly in a Model III.

And vice-versa. Just have the correct OS-80 disk operating system — OS-80, OS-80D or OS-80/III — in each computer.

Moreover, with OS-80 systems, you can add, delete, and update files. You can read and write diskettes regardless of the system of origin.

OS-80 is the original Percom TRS-80 DOS for BASIC programmers.

Even OS-80 utilities are written in BASIC. OS-80 is the Percom system about which a user wrote, in Creative Computing magazine, "... the best \$30.00 you will ever spend."[†]

Requiring only seven Kbytes of memory, OS-80 disk operating systems reside completely in RAM. There's no need to dedicate a drive exclusively for a system diskette.

And, unlike TRSDOS, you can work at the track sector level, defining and controlling data formats — in BASIC — to create simple or complex data structures that execute more quickly than TRSDOS files.

The Percom OS-80 DOS supports single-density operation of the Model I computer — price is \$29.95; the OS-80D supports double-density operation of Model I computers equipped with a DOUBLER or DOUBLER II; and, OS-80/III — for the Model III of course — supports both single- and double-density operation. OS-80D and OS-80/III each sell for \$49.95.

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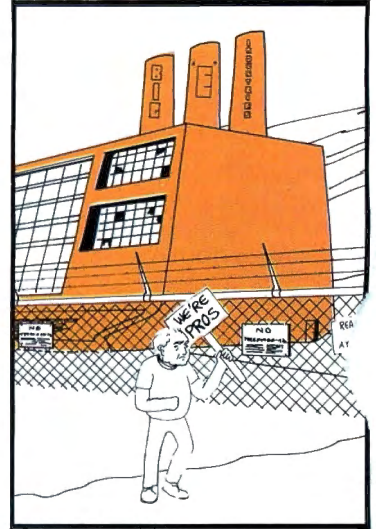
by Chris Brown

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*TRS-80 is a trademark of Tandy Corp.

80 REMARKS

by Wayne Green

“...nothing like this is simple. Involved was...another unit which had been zapped by lightning...”

Bum Rap for Lynx

The modem review in the September issue (“Spanning the Electronic Nation,” page 134) came down hard on the Lynx people, who responded with cries of anguish and foul play. After looking into their product I’m inclined to agree that they got a shafting this time.

Of course, nothing like this is simple. Involved was an old prototype system which had been kicking around our offices for months, plus another unit which had been totally zapped by a lightning strike nearby while it was in use. Add to that some severe phone company problems in merely getting the signals to the modem in useful shape.

On the positive side for Lynx, I don’t recall any complaints from readers about the unit, and since I encourage this type of communication, I generally get quick feedback when there are product problems. And it has not escaped my notice that the Lynx unit has been used in most of the service net demonstrations at shows.

The Lynx people are moving rapidly in their development of the modem technology, working towards 9,600 baud communications. I visited their plant and watched some new products run through their paces. We may soon have an article on their new model, which is due soon and carries automation of the modem business much further.

I was not dismayed to discover two of their top people are hams. Most micro-computer firms seem to have hams involved, so I wasn’t really surprised.

Their current model uses state-of-the-art design and construction and worked like a charm despite anything I could do to screw it up. ■

The Office Revolution

Will the day come when we really don’t need secretaries any more? I’m convinced it will and I think I see the way it will come about.

The first step is the normal executive

desire to have the latest in gadgets. This will bring the computer to the elbow of the executive (as soon as some furniture firm wakes up to the need for an executive desk placing the computer where it is handy to use).

The computer will begin by providing instant interoffice communications, access to data for decision-making, E-Z Calc worksheet planning and so forth. The word processor will encourage sending notes in answer to business letters, getting us into a much less formal correspondence style. Once we can live with a business letter which does not have to reassure the recipient of his name and address, much of the secretarial role will have faded away.

“Will the day come when we really don’t need secretaries anymore?”

Our computers will be able to remember addresses, file correspondence copies, and all those lovely things the secretary used to do.

Considering the problem of finding good secretaries, the path of least resistance for executives will be to depend more and more on that computer by their side.

Speaking of which, it’s been some time since I’ve written about the need for smaller computers or terminals which are connected to the office computer system via a radio link instead of the usual umbilical cord. We have radio telephones now, so separating the computer from the system by a radio link is not a big step.

We’re remote-controlling our television sets and lights, so why not our computers? My concept of the coming of-

office computer is one that will be much like a hard bound book, with an LCD display inside the cover which can be read when you lift the lid. The keyboard will be like those on the hand-held computer systems, though in typewriter keyboard format.

With a portable terminal like this you would be able to use it as a computer by itself, or, if you were around a host system, you could dump letters for printing, access data, and communicate with others via it and the phone lines.

Recent calculator-sized television sets have an LCD screen which seems easily adaptable to our needs. Other than making things a bit smaller, there isn’t a lot more to invent before we have this new type of micro-micro computer. ■

TRS Typesetting?

Well, yes, to some degree it is coming to that.

More and more of the larger typesetting systems are able to accept material over phone lines. Instead of tying up machines costing \$15,000 or so while setting manuscripts in type, it is possible to use the TRS with a good word processor program and dump the copy directly into the typesetting system.

Once you have a communications interface for a typesetting system, material can be accepted over the phone lines from authors, or run from disks or cassettes into a TRS and sent to the typesetter. I think we will be seeing more microcomputers used to write material for publication and to edit it.

We’re nearly ready to handle columns and even articles submitted on disk or cassette. We’ll edit them on a TRS and then send the material to our typesetting system. There an operator will add the typesetting instructions. Since this takes a fraction of the time required to type the article, the flow of material through this end of the publishing cycle will be speeded up and costs cut substan-

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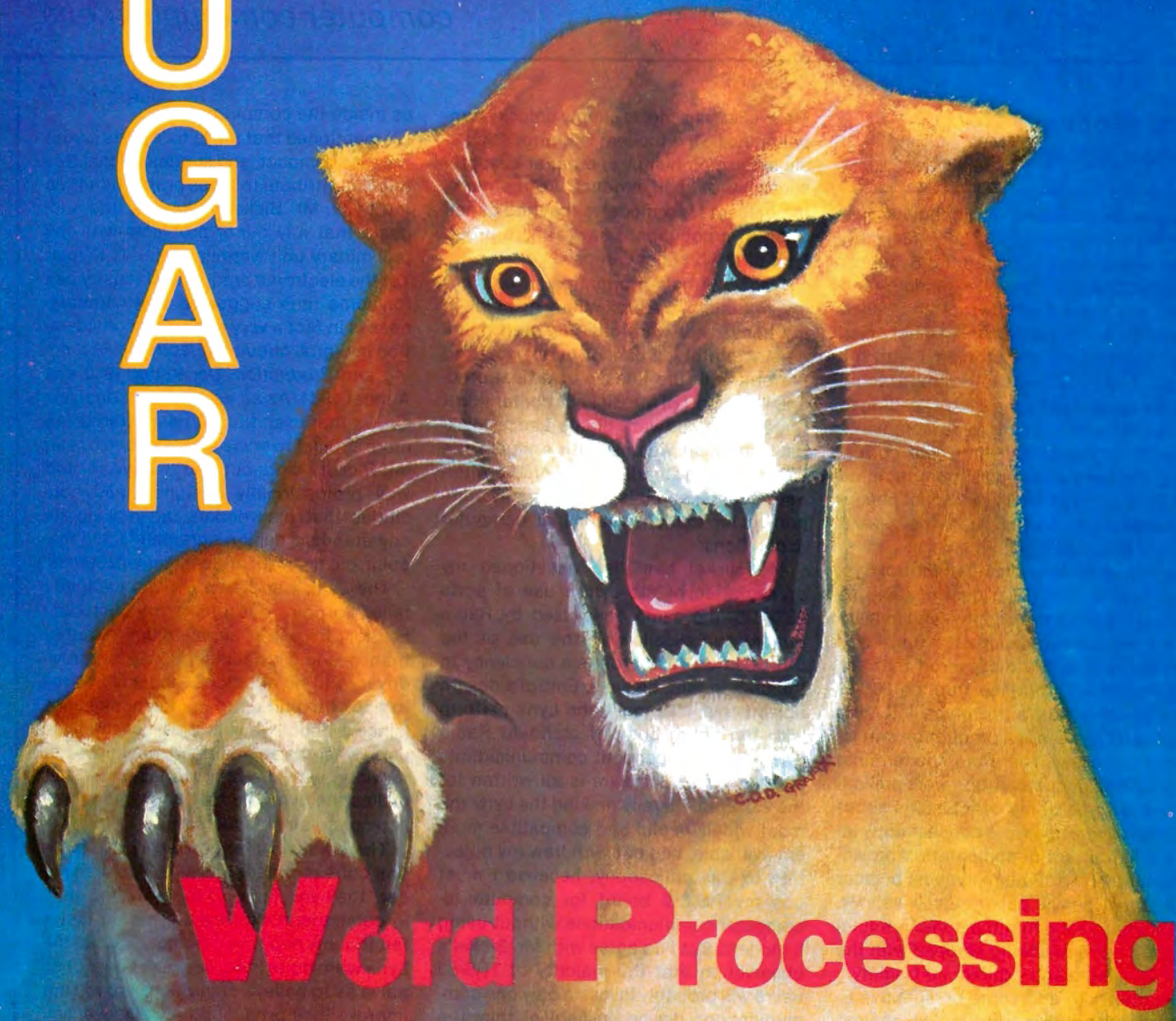
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for virtually all personal
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Lynx Modem Reconsidered

September's review of modems (Spanning the Electronic Nation, page 134) drew loud cries of "foul" from Emtrol Systems, manufacturers of the Lynx modem (and from Lynx owners who wrote and called by the dozen to defend their machines). Yes, there were some problems with the review, and in fairness to Emtrol, I would like to explain briefly the events leading to the review and expand some comments about the modem. But first, two corrections: the Lynx board was manufactured on Mil. Spec. FR-4 epoxy glass, not phenolic material as I stated. Also, the current price is \$299, not \$249.

I spoke with John Bickel of Emtrol Systems, who took a great deal of time explaining Emtrol's philosophy, and in helping me track down exactly the unit I had used for review. He discovered that the Lynx machine I obtained through *80 Microcomputing* was a *prototype* intended for product news, not a production unit intended for review. Therefore, the terminal program and documentation were preliminary, and some of my conclusions about the unit's operation were consequently invalid. The current documentation provided by Emtrol is a 12-page, typeset booklet printed on heavy paper. Likewise, Mr. Bickel informs me that the dumb terminal program currently being shipped with the Lynx is reliable and exhibits no fragility.

Let me try to add some perspective to why I would put this prototype up against production units. The review process was begun over 15 months ago. Articles, especially long ones with photos or diagrams, go through an extensive in-house preparation process; this review was submitted at the end of 1980. During the interim, I made a few changes to the article, but my conclusions about the Lynx remained the same. Why no changes to the Lynx comments? Because, ironically, the two Lynx production machines I saw during that preparation period performed even less adequately than the copy I reviewed. This,

Mr. Bickel tells me, is simply unlucky happenstance. One modem is Emtrol's "classic service problem," and not at all representative of their product. Furthermore, the present Lynx model is the third generation in production; I saw a mere prototype of the first generation.

I accept that information. I was *not* aware that I had a preliminary machine in my hands, nor were other *80* staff members. A prototype cannot be expected to perform with the finesse of a final product; in support of Mr. Bickel's contention, I understand software giants Lance Micklus and Scott Adams both endorse the Lynx, as does Charlie Butler of The Alternate Source, and it is used by many companies for demonstrations at computer expositions.

Mr. Bickel has also questioned my presentation of the Lynx's use of ports 232-235 (the same ones used by Radio Shack, and disallowing the use of the Shack's RS-232 board) as a deficiency in the unit. In fact, he says, Emtrol's design objective was to make the Lynx perform with the entire body of standard Radio Shack and independent communications software. This software is all written for the 232 area, thereby making the Lynx the most widely useful and compatible modem available. I do not withdraw my objection to this philosophy, because I must use my RS-232 board for computer-to-computer communications without using a modem. But I do agree with Mr. Bickel's observation that the majority of TRS-80 users will probably invest in only one communications device. In light of this, the Lynx unit is in fact easier to get up and running than the RS-232 board/acoustic modem combination provided by Radio Shack, and will be preferred by many TRS-80 owners. Very few users, Mr. Bickel suggests, will face the conflict I presented. Therefore, though the Lynx would not suffice for me, it will be satisfactory for virtually all personal computer communication applications. Furthermore, the Model III version (because of differences in the Model III port hardware) does not conflict with any internal communications devices

inside the computer.

I mentioned that the Lynx's parts layout was not compact, and suggested that this might contribute to noise problems within the Lynx. Mr. Bickel disagrees, and suggests that any minor problems with the preliminary unit were unrelated to layout. Yet the electronic production industry has for some time suggested that compactness is in fact a very important consideration in digital circuitry (*Electronic Packaging and Production*, December 1980 and August 1981. As an aside, recent analysis shows that even flat PC board traces are more subject to noise than rounded ones!) Mr. Bickel points out that the Lynx board was professionally designed, and concludes that his vendors did not violate any standard design parameters. On this point, our theoretical disagreement stands.

The Lynx also has a few advantages I failed to point out: unlike the Microconnection, its power supply plugs in rather than needing attachment with a screwdriver. And no additional cable is needed to hook the unit up to the telephone lines (since a double jack is a part of the Lynx unit), whereas an additional hookup is not provided with the Microconnection. That makes the Lynx the only unit of the three "complete as shipped."

There was no intention on my part to (as one correspondent called it) "cold shoulder" the Lynx, but only to review the units in comparison with each other. In fact, I felt that my negative comments about the Lynx were quite mild, because I am not so naive as to believe manufacturers will not improve their product if they discover any limitations. Therefore, for the factual errors pointed out in the first paragraph above, I apologize to Emtrol and Lynx users. I look forward to receiving a new Lynx unit for review, and will report to readers as soon as possible. In the meantime, let me reiterate that the Lynx has been well received over the past year, and deserves the serious consideration of any reader about to enter the world of computer communication.

Dennis Bathory Kitsz
Roxbury, VT



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META NOTATIONS. . .

MTC introduces its FREE computer "bulletin board" service. Set up your terminal or terminal software for 300 baud, parity disabled, 8-bit word length, and 1 stop bit. Dial (216) 289-8689. After the connection is established, type LOGIN META. When asked for a validation code, type META. Have fun!

In a couple of months MTC will introduce the successor to AIDS-III/CALCS. It is called AIDS/P™ and is based on MTC's PRIMAL™ (Practical Relational Information Management Applications Library), a powerful system for PRIME minicomputers. AIDS/P features the best of the critically acclaimed AIDS-III/CALCS but is probably an order of magnitude beyond it in power. It will be first made available to AIDS-III/CALCS owners (for an upgrade charge), then to the general public. Price will be in the \$200-\$300 range.

Effective September 1, 1981, Metatronics Corporation became a subsidiary of MTC. Metatronics will carry the complete MTC product line in addition to its own. Order processing and fulfillment departments have been combined to improve service response levels. MTC's superior software and supplies marketing, and Metatronics exceptional peripheral offerings should prove to be a formidable combination. (Sorry guys, if you can't beat us, join us. . .)

MTC now offers a more complete selection of diskette products (ad deadlines prevented inclusion in anything but this column). New manufacturers are MAXELL and 3M. Definitely call for specific information. For example, MAXELL Brand 5 1/4" diskettes in a PLASTIC LIBRARY CASE are only \$34.95 for a box of 10! SCOTCH Brand diskettes are comparably value-priced. MTC is also introducing its own PARAGON™ Brand media products. The intent is to offer a super-high quality product at a very competitive price. For example, a box of 10 single-sided, soft-sectored, double-density, 100% certified diskettes with HUB RINGS is only \$24.95! A full line of products (including HEAD CLEANING KITS, etc.) will be offered. The PLAIN JANE™ (almost 200,000 units sold) diskette line will become part of the PARAGON™ MAGNETICS operation (but don't quote us verbatim).

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by David Stambaugh

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Maxi Micro Manager

I wish to thank your magazine and Wynne Keller, the author, for the fair and impartial review that our program, "Maxi Micro Manager" received in your recent article, "Choosing a Data Base" (August 1981). Such an article has been long awaited and needed by the buying public to help in determining which of the many data base programs are best suited to individual needs.

However, as is the case in most reviews, errors and omissions occur. I would like to take this opportunity to correct the most obvious and set the record straight. First and foremost, the program reviewed by Mrs. Keller was one of our earlier releases. Both the name and the software has changed. The name was changed in January 1981 due to a conflict with another software package; the new name is Maxi Manager System. I hope that your readers take note so as not to purchase the same program twice.

I am pleased to say that we have just rewritten the MMS documentation and now include several simple, easy to follow examples covering all aspects of the program's functions. The new manual (over 120 pages) is now distributed in a three-ring binder to facilitate the addition of new pages as new features are added. Several sections of the previous manual have been retained but are now relegated to the technical reference section.

One of the major enhancements of the new A.3 version of MMS involves the initialization of a new data base. As stated in your review, "this takes time; go have a cup of coffee or lunch if you have several drives." With the A.3 version, the entire process takes less than two minutes. While the article mentions that MMS limits the length of any single field to a maximum of 40 characters, it doesn't mention that MMS allows a single record to contain a total of 800 characters, unlike both CCA and ADISIII, which limit record size to a maximum of 255 characters.

The article goes on to say that MMS rarely allows the user to exit from a routine once started. This is not true. Video screen prompts usually provide safe exits back to the main menu of the program. Input is also said to be slow due to the use of a flashing cursor. While it is true that MMS does use a high speed machine language INKEY\$ routine, its speed of character acceptance (on Model 1 versions) is variable and can be set by the user to correct for Model I key bounce problems. Perhaps Mrs. Keller set the Key De-bounce Factor to its slowest setting.

The Select features of MMS have also

changed. A sixth search criteria, 'NOT IN-STRING' has been added, logical And/Or relationships may now be established between fields as well as within fields, the masked search feature has been corrected and now properly works with numeric fields. The most useful new feature of all is Maxi Manager's ability to locate records regardless of the upper/lower-case spelling of the selection criteria or data contained within the data base.

Mrs. Keller also fails to mention the Search and Delete feature, handy when maintaining subscription lists. While it is true that "MMS allows paging back or forward to the next record in the file," the software also allows paging forward to the next record in the search.

Perhaps the most welcome new feature of all is the Multi-Level Sort. We have to agree with Mrs. Keller when she states that if a data base cannot sort at least two fields at once, it is seriously flawed. Copies of the program that are delivered after August 15 will include this new feature. Also, registered owners will be notified and offered the upgrade.

Last but not least, we have listened to our user's problems regarding our sophisticated print module. The A.3 version of MMS includes a new utility entitled Docufile. This utility enables the most inexperienced MMS user to easily create the required print documents (labels, reports, letters, etc.).

We also see the need for different data base software for varied applications. In this regard, we share Mrs. Keller's sentiments regarding the AIDSIII package and now include a utility that allows AIDSIII files to be merged into MMS files. This option allows small data files to be created with AIDSIII; then when the files grow and become unmanageable, one simply merges them into MMS. This feature indirectly gives AIDSIII the ability to hand-shake with a word processor.

Dale Kubler
Exador, Inc.
Roswell, GA

Improved Version

I was unable to examine the new version of the Maxi Manager database program (formerly called Maxi Micro Manager, from Adventure International) in time to include comments on it in "Choosing a Data Base" (August 1981).

Since then I have used it extensively and have noticed considerable improvement over the earlier version reviewed in the article. A new printing utility program greatly simplifies the printout process. It

is no longer necessary to use a word processor to create a file of report commands. The printing utility program may be requested instead. This utility allows all margin, paging, column and row options to be set by answering simple questions. I would now rate Maxi Manager easier to use than CCA for generating reports. A word processor such as Scriptit or Electric Pencil must still be used for form letter applications or for reports which need explanatory text.

Wynne Keller
Solon, ME

CCA Data Manager

As co-author of the program CCA Data Manager, sold by Personal Software, I was pleased to see it reviewed in the August issue of *80 Microcomputing*. The reviewer, Wynne Keller, did a fine job pointing out the strengths and differences of the three products.

There are two errors in the review regarding the CCA Data Manager, however. The arithmetic capabilities actually do provide exponentiation, including roots. Also, the report writer does allow a sorted file to be processed without exiting the program and re-naming with TRSDOS. Refer to the numbered message explanations at the back of the manual for instructions on these features.

Chet Floyd
Manhattan Beach, CA

Profile Left Out

I am an avid fan of *80 Microcomputing* and have been since its inception. I have noticed, though, that most of your authors tend to downgrade anything to do with Radio Shack. One article in particular concerned me enough to make me sit down with my super homebrew letter-writer for the Model III and write you this note.

The article by Wynne Keller, "Choosing a Data Base," spoke of three data base programs. The article was well written and did describe the three programs fairly well (I have two of the three), but the author omitted Radio Shack's Profile for two weak reasons: It can only sort one field at a time; and it cannot perform calculations. The author excused MMS for the same faults.

Now to Profile. Currently, we use two Mod IIIs and one Mod I to adjunct our main edp effort. Many of the programs we use are either on Profile or are homebrew. We use no other canned programs, because most business programs are either



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 - SKIP RECORD (to next or previous record).
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 - Example: Select records representing those sales made to XYZ COMPANY that exceed \$25.00, between the dates 03/15 and 04/10.

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Frank Boehm, Director, Front Door Residential Treatment Program

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poor and don't really fit, or are so complicated that you must hire a programmer to operate the thing. Profile makes better use of disk space than any other data base program. It will accept up to four disk drives for one record. True, you wait awhile for the files to be formatted, and the sort is very slow, but the amount of files per disk is fantastic.

With MMS, you must call up another program in order to perform calculations. With Profile, you can write a basic program to call up Profile data direct from the disk and accomplish the same thing—automatically, if you want. I can even sort with a separate machine-language module, put Profile data on Visicalc, and hand-shake with Scripsit.

Profile is disk-based at all times. You will never lose the data during a power failure, except for the entry you didn't have time to save. Incidentally, the comparative number of files per disk (drive 0 with DOS), say of a file whose length is 132 characters including 16 spaces for print-out, is AIDS = 187, MMS = 437, PRO-FILE = 1340.

A. R. Pedrick
Kissimmee, FL

Modifying Tiny Pascal

When Lt. Harrel's "Modifying Tiny Pascal for Disk" first appeared (July 1981) I didn't have disk drives. I received them late last month and one of the first things I did was code his PAS32K<PASM0D> fix. After several attempts I succeeded in getting the compiler on disk. I then entered the Filesave and Fileload programs on disk and saved them to disk. Using the short programs provided with Tiny Pascal I tested the new disk modification and was very pleased.

The real test came when I coded his version of Breakout using the Tiny Pascal tape. I attempted to save it as he had instructed and nine tenths of the way through, I got an overflow error in line 10.

Lo and behold, this program was approximately 3432 bytes (1991 codes). It began loading at &H73FO (29680) and continued through decimal 33112. As soon as AD = &H8000 (32768) an error is generated.

I found that by adding the lines below you will be able to continue to read beyond &H7FFF:

- Increase each line number by ten.
 - Now J = PEEK (AD) is line 100.
 - Insert: 105 if AD = 32767 then GOTO 170
160 FD = AD - 65535; AD = FD: GOTO 100
170 A\$ = A\$ + CHR\$(J): GOTO 160
- Now when J = PEEK (32767) it will

branch to 170, store the byte found there and return to 160 in order to convert to the negative numbers (-32767 through -1) in a 32 or 48K machine.

I thoroughly enjoyed his Z-Bug program and was successful in getting it up-high and on disk. However, in module 4, page 160 he defines the catalog and copy messages as MS and calls them as MSG1, MSG2, etc. . . could be a typo.

The Basic disassembler (August 1981) was a godsend. However, it won't PEEK beyond 7FFF and I tried a similar fix but to no avail. Any and all assistance would be greatly appreciated.

Lee Swaringen
Thomasville, GA

Symbolic Dump Printout

After I saw an article in the July issue of *80 Microcomputing* concerning patching RSM to allow it to make system tapes for Model III, I wrote patches to get RSM to print a symbolic dump out to my line printer.

The patches are as follows:

ADDRESS	FROM	TO
7070:	F5	C3
7071:	F1	81
7072:	E1	7F
7F81:	00	D3
7F82:	00	FB
7F83:	00	F5
7F84:	00	F1
7F85:	00	E1
7F86:	00	C9
7F87:	00	F1
7F88:	00	F5
7F89:	00	C3
7F8A:	00	76
7F8B:	00	70

These changes are for the 16K version of RSM-2. For a 32K version the addresses are 4000 (hex) larger, and begin with the prefix A. For a 48K version they begin with E.

Lester Beasley, Jr.
Dallas, TX

More RSM-2 Changes

In the July issue you published a short note from me giving patches to RSM2 or RSM2-D to allow it to read or write tapes for the TRS-80 Model III. This note gives further information that will allow RSM-2 to start and stop the tapes:

ADDRESS	CHANGE FROM	TO
6CDE	04	02
6CDF	FF	EC
6EC5	FF	EC

If you have a disk system, the RSM-2 or RSM-2D tape can be loaded by the system program Tape and the changes can be made with Patch.

Maynard B. Neher
Columbus, OH

WORD Update

Thank you for the excellent review on Word (August 1981, page 234). Mr. Cook had the program quite a long time ago. Here are the updates:

- WORD-4 has a compiled program included free of charge. The compiled version will print as fast as your printer. Many minor enhancements are also included.

- WORD-5 (\$79) has also been available for almost a year. It can merge the data file maintained by our data base managers (IDM-4,5) and our mailing lists (MAIL-5). All versions are also available in Model-3.

Also, Program Listing 1 can be simplified by taking out the following lines:

```
10 .LL 65
20 .PL 50
80 .FI
```

Instead, use default values. Also delete: 200 .EN. It's automatic in 95 percent of the cases.

Tony Pow
Micro Architect Inc.
Arlington, MA

NEWDOS Messages

Owners of NEWDOS 80 V.2 who do not like the "NEWDOS 80 is ready" message can use Superzap to change that to something of equal or less length, such as "By your comand." Display sector 164, enter MOD C9 and input the hex code (see tables in the back of LII manual) for the letters of your preferred prompt.

You can likewise replace the three-line NEWDOS 80 banner with DOS instructions for your users, reminders, notes or whatever. Display sector 17. Enter MOD C4. Bytes C4 (which contains BF) through FE (which contains 2E) can be changed to modify the first line. (That is 59 bytes. Do not type over the "OA" linefeed at byte FF.)

The second line is tricky. The first character of the second line is byte 00 of sector 18. The rest of line two is in bytes 05 through 3D (57 bytes). Typing over bytes 01 through 04 will keep your disk from booting. Line 3 is bytes 3F through 75.

Nelson Ford
Houston, TX



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Hex Conversion

If you have a color computer with Extended Basic or a Model I or III and Disk Basic, you may not be aware of a capability you have. (This also applies to Micro-soft's Level III Basic).

The two functions & and &H are used to convert an octal or Hex constant to decimal. This is a convenient feature, but if you want to use this function on a variable within a program, you will be irritated to find that it won't work! It is designed to work only with a constant.

Because the information following these statements is treated as a string constant without quotation marks the variable following these statements will be treated the same (eg: &HA\$) and give you garbage.

The key to fooling the interpreter is the VAL function. Assuming that A\$ = "FF", use this statement to convert A\$ to a decimal number.

```
A = Val("&H" + A$)
```

After this statement is executed the variable A will equal 255. Use of the octal function is identical except you substitute &O for \$H. Assuming A\$ = "7777"

```
A = Val("&O" + A$)
```

After the above statement the variable A will equal 4095.

*Bill Dickson
Computer Division Supervisor
Offshore Navigation Inc.
New Orleans, LA*

Oddities

I've had my TRS-80 Model I for three years now and have never found an error in documentation or in hardware without reading about it first in the pages of 80. Now all of a sudden these oddities are jumping out at me faster than I can take it!

- It is possible that we disk spinners are getting more for less. While formatting new disks, I answered the "Indicate the number of tracks on the disk" question with 41. Surprisingly, NEWDOS 80 formatted 41 working tracks! I own two Percom 40 track drives. A friend who owns the same equipment also formatted 41 valid tracks.

- On page 14 of the Daisy Wheel II manual a chart of control codes is printed. A top of form code is not listed. I LPRINTED CHR\$(12) which was not listed in the chart. Instantly the printer went to the top of the next form. CHR\$(11) or CHR\$(12) will cause a TOF function. This is contrary to the paragraph above the chart which clearly states: "The Daisy

Wheel recognizes the following control codes and ignores any others."

Faithful readers of 80 will remember Datagen in the August issue. Use Datagen to change your Z80 code into Basic data statements and use your terminal software's "Send Basic Program" function to send your buddy a copy.

*Scott Kantner
Shoemakersville, PA*

Graphics for LPVII

If you have purchased a TRS-80 Line Printer VII and have had difficulty in generating graphics this may help.

Since the line printer does not hand-shake in the dot graphics mode the program must allow the print head to return home before the next print command. A fixed delay would work, but reduce the overall throughput since the head return time is short for a short displacement and any delay used would have to be long enough to accommodate a full-scale displacement. To get around this problem I use a delay which is a function of the displacement as shown in line 220 of the program. The function was determined experimentally and might benefit through some fine tuning of the coefficients.

The magnitude of the displacement is also used to set the high (h) and low (l) field specifiers as required, line 160 (see note on page 11 of the manual).

Finally, a modulo-7 counter is used to suppress the line feed and generate the required graphics character, which provides an effective "line feed" or in this case a "row advance". After the current band is completed a full printer line feed is allowed in line 210 (if P = 6).

*Henry E. Santana
Loveland, CO*

Calculate Color Graphics Codes

The codes for the very low resolution color computer graphics may be calculated about as fast as they can be looked up. Consider the block:

8	4
2	1

For green, to light up 1 use 128 plus 1, for yellow 144 plus 1, for blue 160 plus 1, and so on. For green, to light the top two use 128 plus 8 plus 4 equals 140, for yellow 144 plus 8 plus 4 equals 156, and so on. Take the characteristic color code for unlighted pixels (128, 144, 160, 176, 192, 208, 224 and 240) and add to it the color number plus the number of each of the pixels you wish to light. Use CHR\$(X) for rapid execution. Note that this is the opposite of Level II graphics where the blocks are numbered

1	2
4	8
16	32

and a constant 128 (all pixels off) is added to the sum of the blocks. You can do these operations very quickly and save time over referring to a graphics chart. (Note: you may do it, as for example, CHR\$(128 plus 8 plus 4) in a program, although it wastes memory.)

*Franklyn D. Miller
Cincinnati, OH*

Program Bugs

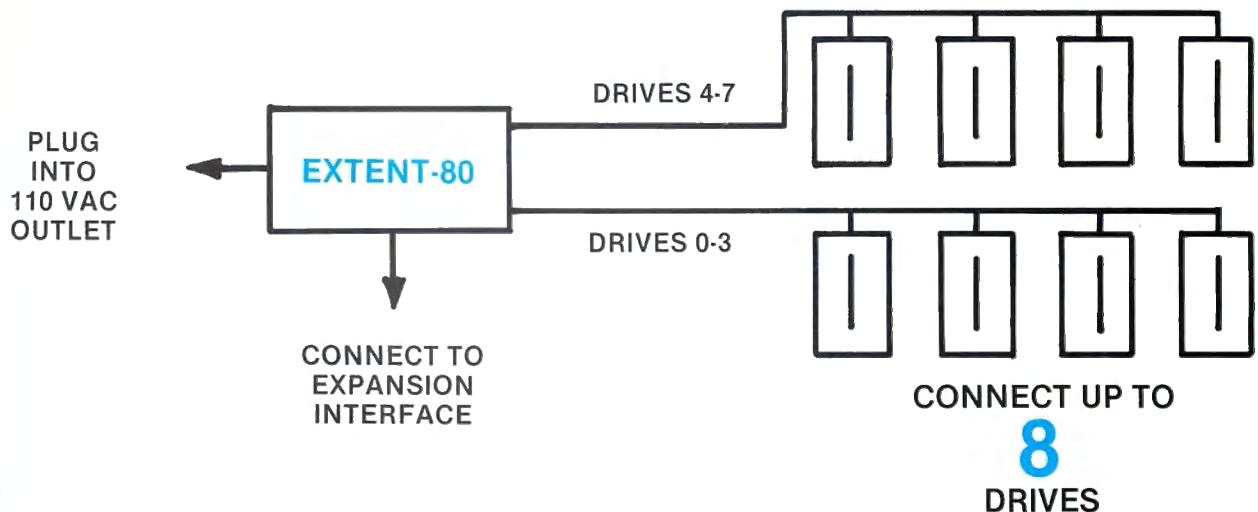
There are a couple of bugs running around loose out there in TRS-80 land. The first and most grievous is in Super-Utility by Kim Watt. Under certain circumstances SU will eat sector five of track 17.

```
100 DEFINT X,P,N,H,L,T
110 LP = 14312 ' LINE PRINTER PORT ADDRESS
120 POKE LP,18 ' SET GRAPHICS MODE
130 PI = 3.141593
140 FOR X = 0 TO 360
150 N = 200 + 200*(SIN(X*PI/90) + (SIN(X*PI/30)/3) + (SIN(X*PI/18)/5))
160 IF N > 255 THEN H = 1: L = N - 255 ELSE H = 0: L = N
170 POKE LP,27: POKE LP,16 ' SET DOT COLUMN ADDRESS MODE
180 POKE LP,H: POKE LP,L ' SET POSITION
190 P = X - 7*INT(X/7) ' MODULO 7 COUNTER
200 POKE LP,128 + 2*P ' PRINT GRAPHICS CHARACTER
210 IF P = 6 THEN POKE LP,10: ELSE POKE LP,26 ' CARRIAGE RETURN
220 FOR T = 0 TO 200 + 3*N: NEXT T ' DELAY
230 NEXT X
240 POKE LP,30 ' RETURN TO CHARACTER MODE
250 END
```

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80 AID

T-Bug Tip

This letter is a response to Jonathan Yarden's plea for help in converting T-Bug for use on a Model III (*80 Microcomputing*, August, 1981).

Replacing the tape I/O subroutines with calls to the ROM is fairly straightforward, and requires changing about 20 bytes. However, since the Model III routines abort tape I/O when the break key is pressed, control will then be returned to Basic instead of T-Bug command level. To avoid this unpleasantness, the modifications must be more elaborate.

Load T-Bug into your Model III and use the M command to change the following bytes:

Start address: Change to:

4643	21	03	42	36	C3	23	36	62
		23	36	47	CD	96	02	00
46DD	CD	87	02					
46EB	C3	FB	46					
4762	CD	F8	01	C3	A5	43		
4782	C3	35	01					
478C	C3	64	02					
47C5	C3	F8	01					

Then use the M command to set the desired baud rate, and write your Model III T-Bug tape (P 4380 4980 43A0 TBUG). Happy T-Bugging!

*Herb Robinson
3814 Skyline Rd.
Carlsbad, CA 92008*

Game Confusion Cleared

I have a solution for Dennis Banik's problem of reading data from different blocks within a Basic program ("Game Confusion" *80 Aid*, August 1981). Duplicate this routine, in each block which requires reading data, ahead of any Read statement and after any Clear statement.

```
W = PEEK(16627) : POKE 16640,
PEEK(16628) + (W>239) : POKE 16639,W
```

If any Restore's are required in a particular block, make this a subroutine which the program skips over.

```
30010 REM BLOCK SIX
30020 GOTO 30040
30030 Q = PEEK(16627) : POKE 16640,
PEEK(16628) + (Q7239) : POKE
16639, Q : RETURN
30040 CLEAR 5000 : REM 'CLEAR' SETS DATA
POINTER TO BEGINNING OF BASIC PROGRAM
...
30160 GOSUB 30030 : REM ESTABLISHES DATA
POINTER IN BLOCK SIX
...
30480 GOSUB 30030 : REM RESTORES DATA
POINTER TO BEGINNING OF BLOCK SIX
```

The first block does not need this routine and can use Restore. In addition, this routine must be contiguous and on the same program line.

*Vernon B. Hester
42403 Old Bridge Road
Canton, MI 48188*

Software Problem?

I am truly delighted with our two disk, 48K Model III. TRSDOS 1.3 is more than I expected. Perhaps the neatest command in the system is CMD 0; it sorts 300 records of 100 byte length so quickly I am not sure how long it takes. The logic, versatility and documentation of the Model III exceeded my expectations.

But I still want more. I want a fast search program. With a disk file of 300 records, I want to be able to flash any one of the records onto the screen as soon as I get the record number. However, if I do an alphabetical search using "INSTR" it takes from 30-60 seconds. Is this too long? Do I have a software problem? To speed things up should I make a short file containing only the names and the record numbers, translate the name to a number and then get the number?

*B. Jim Smith
St. John's High School
Shrewsbury, MA 01545*

Missing Person

In response to Mr. Pflugstag's letter in the August 1981 issue I would like to

apologize to any readers who might have been unable to contact me about my article "Selectric Hard Copy" (September 1980). I moved shortly after this article was published but I am indeed alive, well and living at the address below. I have discussed this project with hundreds of readers and would be more than happy to correspond with anyone interested in interfacing the Selectric. Avid readers of *80 Microcomputing* might have noticed that the missing parts list, other corrections, my new address and telephone number have already been published. Where, you might ask? In the November 1980 issue of *80 Microcomputing*, where else? It is heartening to know that the editors of the best TRS-80 journal are too busy putting together another excellent issue to sit around all day reading old columns.

*Michael W. Bickerton
248 Barren Hill Road
Conshohocken, PA 19428
215-825-7556*

ROM RND Hangup

For some time, I have been dabbling in machine language programming on my Level II 16K Model I. I have run into difficulties, however, trying to access the ROM RND function for a generation of pseudo-random integers within a given range (RND(X)). James Farvour, in *Microsoft Basic Decoded*, suggests:

```
LD ,2
LD (40AFH),A ; set type flag to integer
LD A,50 ; range of random no. 1-50
LD (4121H),A ; put range into WRA1
CALL 14C9H ; get a random no. between 1
and 50
LD HL,(4121H) ; load random no. from WRA1
LDL (RVAL),HL ; to HL, and move to local
area
```

This routine crashes my system. I get an illegal function call (FC), which indicates, perhaps, the attempt to use a negative value for the argument. Looking at the code for 14C9H, the RND subroutine, it appears that the



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By Glynn Owen

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By Dave Stambaugh

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The Software Dilemma

Recently I purchased Trakcess by Roxton Baker through Alpha Byte Stores. I am very impressed. Trakcess has lived up to my original expectations and much more. However, what really surprised me was that Mr. Baker actually encouraged peo-



routine does not access WRA1 for the argument, but HL instead:

```
14C94 C ALL 0A7FH; test for integer flag
      LD ,H
      OR
      JP n,1E4AH; Illegal FC if negative
      OR L
      JP Z, 147FOH; if parameter O, compute RND (o).
```

```
14FOH ;compute RND (o).
```

I have tried putting a parameter, or O, into HL directly, prior to calling 14C9H. The program does not crash, but the output in WRA1 (4121H) is not limited to the desired range. Does anyone know the answer to my problem? Any help will be appreciated.

*Thomas R. Jones
235 East 73rd Street
New York, NY 10021*

Network Help

Is there anyone out there who can show me how to build a switching network (or point me in the direction of commercially available hardware) to interconnect my Model I, Model II, Daisy Wheel II and Line Printer V?

My problem is the risk of damage to circuit board and connector plugs (not to mention the time that it takes) from continually plugging and unplugging printers when I need letter quality or high-speed printing as output from an application running on one computer or the other.

*Peter C. Bennett
7139 Scott Road
Homer, NY 13077*

ple to share the cost of the program and use or make copies of it jointly.

As a full-time student with a part-time job, this is like a dream come true. Not everyone has money to shell out like candy for programs they do not even know if they can use or enjoy. If more people would follow this fine example, they would see increased sales as they would be opening their programs to a larger market.

Another point that Mr. Baker brought up is protected disks. Having written software myself, I think that the author has a right to be concerned about his software. However, this should not be at the consumer's expense. The consumer should be able to make as many backups of a program as he or she wishes. It is not fair to pay \$100 for a program and then have to pay \$10 plus shipping if the thing crashes.

*David A. Roch
El Paso, TX*

On The Right Track

I just got my NEWDOS 80 to run on my 80-track drive and it turned out to be quite an undertaking. I had to use the MAKE 80 on the original NEWDOS 80 disk to make it readable to my 80-track drive. Then I received my LN Doubler. I tried to make Doublezap II work, but had no luck. It apparently needed more tracks. Then I decided to play with it and converted a NEWDOS copy to 40-track using the PDRIVE and changing the Gat table to eliminate all reference to tracks 40 to 79. I applied Doublezap II and it worked.

I also put it up with an expanded directory. When the run was completed, I had to use PDRIVE to get 80 tracks again and change the Gat table again. TR 17 SEC 0 byte 46 to byte 8DH got zapped to FCH and byte CCH to CFH became 8EH 50H 96H 42H. (See Table 1.) This is now an 80-track system disk with the free showing * 80 trks 114FDES 220 grans * on a side with sample 01/BAS removed and the Doublezap II utilities installed. It was really great to figure it all out.

*John H. Fields II
Venice, FL*

Stock Market Crash

I recently bought Color Space Traders from Spectral Associates. It involves buying stocks in hypothetical companies and

trying to increase their market value. After playing the game a few times, and losing miserably each time, I began to wonder if all my work as a business undergraduate and weekend programmer had been in vain.

Then, much to the delight of my ego, I discovered a flaw in the game. When a stocks' value exceeds \$3000, it splits two for one. The price is split in half, and the number of shares held by each player should be doubled. A For...Next loop is set up in line 3190 to do this, but a programming oversight left out the Next so that only player number 1 has his or her quantity of shares doubled, even though its value had been divided by two. Editing the program as I've done here makes it run correctly:

```
3190 FOR I1 = 1 TO P1:S(T1,I1) = 2*S(T1,I1);NEXT I1:
GOSUB 5000:RETURN
```

*Ken Teagan
Glendale, CA*

Tom Rosenbaum of Spectral Associates tells us they've found the error, and have corrected it.—Eds.

Variance

C. Brian Honess' article "Vital Statistics" in the August issue contained one significant error. The mathematical form of the variance is generally taken to be:

$$\sigma^2 = \frac{\sum(x - \bar{X})^2}{(n - 1)}$$

This differs from Mr. Honess' equation in that the denominator contains an $n - 1$ term instead of just n . In calculations involving a large number of data points (large n) the difference is insignificant. However, in smaller samplings it can be quite large.

The reason for the $N - 1$ term instead of n is somewhat complex but it stems from the fact that each of the data points are first used to calculate the mean value of the sample (\bar{X} in the formula) and the data points and the average are then used to calculate the variance. This two-step calculation is said to reduce the degrees of freedom of the system from n to $n - 1$. Refer to any elementary statistics book for a thorough explanation.

*Albert Stiegman
Department of Chemistry
Columbia University
New York, NY*

80 CALENDAR

November

● The University of California, Berkeley, will sponsor a two-day course titled "Comparison of Recent Microcomputer Architectures" for design engineers, programmers and technical managers at the San Francisco Airport Hilton, Nov. 9-10. Fee is \$400. Information and registration is available through the office of Continuing Education in Engineering, University of California Extension, 2223 Fulton St., Berkeley, CA 94720.

● The New Mexico Computer Society will host the third annual **New Mexico Computer Fair Nov. 14** at the Albuquerque Civic Auditorium. Admission is free. Information is available from Ron Benninghoff, c/o New Mexico Computer Society, 515 Wyoming NE No. 2, Albuquerque, NM 87108

● Ken Orr and Associates, Inc., 715 E. 8th St., Topeka, KS 66607, will sponsor several courses and conferences in November. Subjects are: **Nov. 3-6 Structured Requirements Definition, San Antonio, TX; Nov. 3-6, Structured Program Design, Boston, MA; Nov. 10, Management Overview of Data Structured Systems Development, Denver, CO; Nov. 11, Management Overview of Data Structured Systems Development, Portland, OR; Nov. 13, Management Overview of Data Structured Systems Development, Seattle, WA; Nov. 9-13, Structured Systems Design/Structured Program Design Combined Course, St. Louis, MO; Nov. 10-13, Structured Requirements Definition, Los Angeles, CA; Nov. 16-20, Structured Systems Design/Structured Program Design Combined Course, Washington, DC.**

Coming Next Month

In December, *80 Microcomputing* looks at the TRS-80 used in hobbies. Topics will include micro games, sports forecasting and collection filing systems.

Athletic Technical Editor Michael Vose will share his Runner's Log program. Dust off those sneakers and find your sweatsuit!

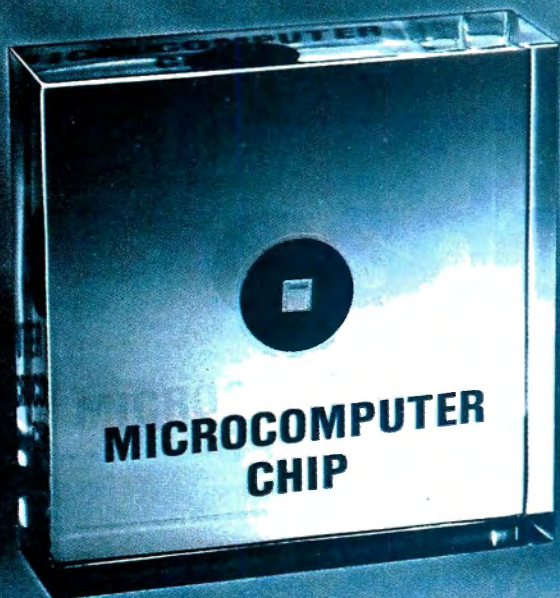
Review Editor Michael Nadeau has compiled a Buyer's Guide to peripherals and small electronics.

News Editor John Mello gets the scoop on Arcnet, the Model II network. News Editor Bert Latamore has tracked down a model railroad club that uses a homemade micro.

Freelancer Robert Lloyd writes about the program he wrote to catalog his coin collection.

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80 REVIEWS

edited by Michael E. Nadeau

"For getting correspondence out quickly, this mini word processor is simplicity itself."

Speed Letter
12-Column Ledger
Three-Across Mailing Labels
Auto-Dialer and Toll Charge Monitor
Blechman Enterprises
Canuga Park, CA
\$10 each
\$25 for the package

by Dave Smith

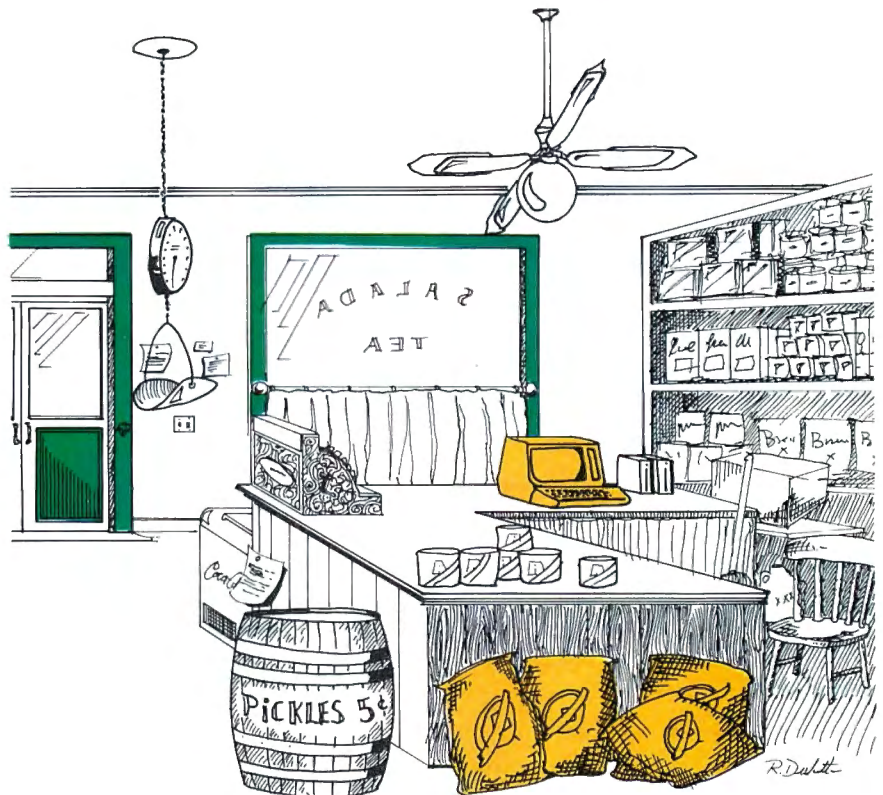
Anyone who has ever operated a small business out of his home understands the difficulty of maintaining a ledger, handling letters, mailing lists, and keeping records of telephone usage and expenses. In response to these needs, numerous computer programs have been designed, which are often too extensive and complicated, not to mention costly. Fred Blechman, of Blechman Enterprises, has developed a package of programs for the home-based businessman which is characterized by effectiveness, simplicity and low price.

Designed for the Model I with 16K and an 80-column printer, the programs do not require disk drives, and are compatible with the Model III following a few simple line adjustments. The instructions for the Model III program changes are available at no charge from the author.

Speed Letter

For getting correspondence out quickly, this mini word processor is simplicity itself. Handling upper and lowercase, the word processing system is directed by a total of 10 single-letter commands. Speed letter can pack 150 lines of text into 16K of memory.

The program operates on lines of text rather than on individual words or characters, but within this single constraint, allows text review, line correction, replacement, insertion and deletion. Text is saved to, and read from cassette, or Exatron's Stringy-Floppy wafer. The left margin and the page length are defined just prior to printing, allowing the user great formatting flexibility. Printed output is also line selectable but vertical spacing



can be achieved only by the inclusion of blank lines in the text.

This program's best feature is that it appears to be crashproof, eliminating the worry of lost text through entering an erroneous command. This is a real blessing to the writer who formerly became so involved in the content of his text that he forgot the complicated command structure of his word processor and bombed his text.

12-Column Ledger

Using column one for the dollar amount, and allowing the user to assign the remaining 11 column headings, 12-Column Ledger maintains and prints financial records for income tax and other purposes. All column headings are on display during data entry. The user simply types in date, check number, amount, recipient, purpose and column assignment, and the program prints out all column

headings with page, month and grand totals. Characterized once again by ease of operation, this software performs all necessary arithmetic and produces a clear, easy-to-read printout.

Three-Across Mailing List

This program accepts up to 220 names and addresses (in 16K), sorts data according to user preference, and prints addresses on standard adhesive-backed label stock, laid out in three-column format. Each label contains four lines of 24 characters maximum length. While the Mailing List program is excellent for the small business, it should also be attractive to any organization, church, fraternal order or social group which issues a newsletter or other mailings to its membership.

Auto-Dialer

Auto-Dialer uses a \$3 telephone inter-

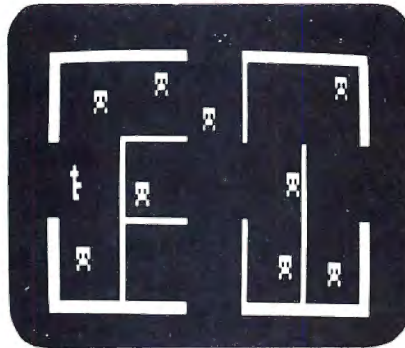
WHY

IS THE ALPHA JOYSTICK SUCH A SUCCESS ?

A: Software support like this:



TALKING ROBOT ATTACK



Actual unretouched photos

TALKING ROBOT ATTACK

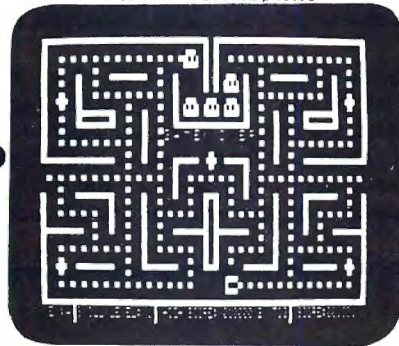
INCREDIBLE! This amazing game actually **TALKS** without a speech synthesizer, through the cassette AUX plug.

You are armed with just a hand held laser. In a remote section of the space station you encounter armed robots, some march towards you, some wait around corners. Watch out, the walls are electrified. Zap as many robots as you dare before escaping into a new section where more robots await you. The struggle continues. With Joystick action and **VOICE OUTPUT**, this game will amaze you.

ALL GAMES:
16K Level 2, Mod 1 + Mod 3 Cassette: \$15.95
32k Level 2, Mod 1 + Mod 3 Diskette: \$19.95
10% discount for 2 games, 15% for 3 or more
Games may be played with or without joystick.



SCARFMAN



SCARFMAN



THE LATEST ARCADE CRAZE now runs on your TRS-80.

It's eat or be eaten. You control Scarfman around the maze, gobbling up everything in your path. You attempt to eat it all before the monsters devour you. Difficulty increases as game progresses. Excellent high speed machine language action game. From The Cornsoft Group. With sound.

CAUTION: Played with the Alpha Joystick, Scarfman may become addictive.



SUPER NOVA®

Asteroids float ominously around the screen. You must destroy the asteroids before they destroy you! (Big asteroids break into little ones.) Your ship will respond to thrust, rotate, hyperspace and fire. Watch out for that saucer with the laser! As reviewed in May 1981 Byte Magazine.



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



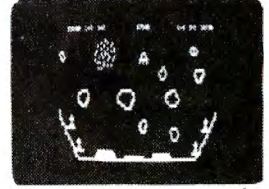
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COSMIC FIGHTER®

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METEOR MISSION II®

As you look down on your view, astronauts cry out for rescue. You must maneuver through the asteroids & meteors. (Can you get back to the space station?) Fire lasers to destroy the asteroids, but watch out, there could be an alien FLAGSHIP lurking. Includes sound effects!

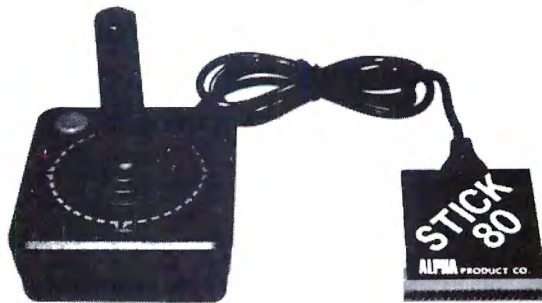
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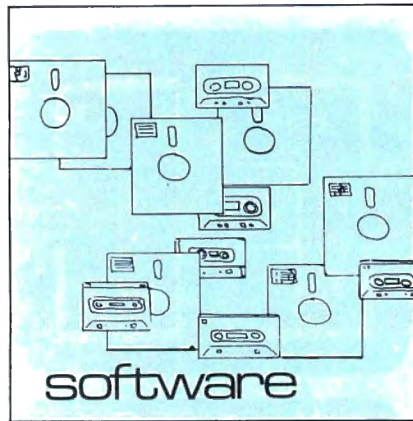
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face relay to dial the number of any 500 names held in memory, upon keyboard entry of that name. The user enters each name and phone number one time. Subsequently, the program lists the names on the screen. The program matches the correct number to the name entered, and dials the number by toggling the cassette output from the computer. This signal is then processed by the interface relay and transmitted to the phone company's switching equipment.

The purchase price of the program includes a schematic diagram for assembling the interface relay and connection to the telephone line. The five relay components are listed with their Radio Shack part numbers for easy acquisition. Assembly of the interface relay should be a simple matter for most anyone.

This program will be of benefit to anyone whose business requires a lot of telephoning, especially when the user needs



to know the cost of the calls. Once the user has entered the current schedule of telephone charges (obtainable from the initial pages of the phone book or from the phone company's business office), the program will time each call and calculate

its cost. The duration and charges for the call are continuously displayed while the call is in progress.

An adjunct to the Auto-Dialer is the Phone Toll Charge program, which is included in the package. Very similar to the Auto-Dialer time and charge monitor, this program is intended for use with one-time, long distance calls.

Each of the four programs is available separately, but the combined price of one package makes it an exceptional buy. The accompanying documentation, while not super slick in format, is more than adequate in content, and all programs are self-documenting on the screen. All are simple to use.

For the small businessman, the person merchandising out of his or her home, the club secretary or any person required to do a lot of telephoning, this set of programs must be regarded as packaged convenience at a very low price. ■

Crash Course in Microcomputers

Louis E. Frenzel, Jr.

Howard W. Sams & Co., Inc.

Indianapolis, IN

Softcover, 264 pp.

\$17.50

by Debra Marshall

80 Microcomputing staff

This book is a self-teaching course in the basics of microcomputers. It is designed to provide the newcomer with a solid basic knowledge about the construction, internal circuitry, and operation of micros so that the reader may proceed painlessly to more complicated and less generalized material.

The chapters are fairly short. Each chapter covers a very specific part of the microprocessor, such as memories, binary data, I/O operations, peripheral equipment and programming. Each topic is covered in a set of short explanatory sections, which are further divided into single concepts which are eventually assimilated into the whole picture of the topic at hand. Every paragraph is followed by a question designed to reinforce the key word or concept presented in the paragraph, and each chapter ends with a short quiz which again covers the concepts and vocabulary presented.

The chapters are built on one another; in other words, the concepts in previous chapters must first be fully assimilated in order to appreciate the information in subsequent chapters. I found this pro-

gressive method to be very effective; while new information is constantly presented, the old information is concurrently reinforced.

Although the questions asked as reinforcement following each chapter section often seem painfully obvious, the method does seem to work. By simply reading the chapter on binary data, I learned more about microcomputer number systems than I ever hoped to know. In fact, I learned enough to believe Dennis Kitz when he says that machine language is a piece of cake.

“Although the questions asked as reinforcement . . . often seem painfully obvious, the method does seem to work.”

The book assumes you have literally no prior knowledge of microcomputers. The first chapter explains what a microcomputer is, what it does, what it is made of, and presents basic terms such as micro-

processor, data, memory, digital timer, and monitor. Explanations are accompanied by nicely executed illustrations and photos.

You do not need an electronics, math or technical background to use and appreciate this book. At the same time, it was aimed at an audience which would include professionals who wish to learn about the microcomputer field, and so the tone of the book is businesslike, to the point, and highly readable. Its physical make-up is also nicely presented: Type is well set, it is nicely laid out, and has been carefully edited. Figures are simple and well-documented.

In spite of its simplicity, the book speaks to readers who intend to pursue microcomputers further. The last three chapters cover the basics of machine language and Basic programming. Two appendices, covering the 8085 instruction set and the ASCII code, are also included.

The book meets its goal: Anyone who reads it has to come away with at least a working knowledge of the microcomputer, and one that will leave the reader well-versed in the lingo of the trade. This book would be an incredible boon to any business office which has just had one of those totally mysterious and incomprehensible machines foisted on it, as well as to anyone who wants to demystify the machine which is steadily making inroads into the most common areas of society. The book is well worth its price, and well worth the time it takes to read it. ■



THE ALPHA I/O SYSTEM

a complete failure?

THE INSIDE STORY

It happened 3 years ago, when our President made a decision. At the time we specialized in custom analog and digital circuit design. The decision was to attempt to develop a line of standard interface hardware for the emerging microcomputers. At the time (1977) we had to decide which of the new machines could become the "industry standard" of the low cost micros.

Despite a few aggravating but minor deficiencies, the TRS-80 seemed to have the most chance of success and it had the best price/performance ratio. Also, with some imagination, their large sales organization could become the largest service network in the world, a reassuring thought for the many novices in this new field.

It became clear that the TRS-80 could be used (with our then hypothetical system) to solve problems in many fields where computers were not yet used, mostly because of their high cost.

The IDEA was simple! ALPHA PRODUCT would supply the missing link between the TRS-80 and the "outside world". (more about this "outside world" later)

Early Survival

DANGER! If Radio-Shack entered the same market, we probably would not have survived, but the expectation was that they would be too busy developing their basic line (drives, printers, modem etc.). Thanks to our more specialized products, we would not be competing with them.

BAD START! We began with a failure. Our first product was supposed to be a simple, low cost, general purpose device. It would allow the TRS-80 to accept inputs other than the keyboard. Many kinds of external devices (the "outside world" mentioned before) like photocells, sensors, thermostats, switches, contacts, etc., could be connected easily. In addition, there were two relays to control (on or off) external loads such as motors, lamps, appliances, heaters, etc., etc.. In other words, it would allow the computer to interact or interface with external devices. We called it the INTERFACER 2. What a mistake! It sounded too much like "expansion interface". Many enthusiastic TRS-80 users called thinking that our "INTERFACER 2" was a low cost Expansion Interface (at \$85 that would have been a real bargain!) We wanted to change the confusing name. That meant reprinting the manual, changing the ad, scrapping the flyers, discarding the silk screened cases. Well, "INTERFACER 2" it would stay.

TROUBLE! We also found that the majority of TRS-80 users were AFRAID of the hardware. They could be very comfortable with fancy programming but thought you had to be a computer specialist or technically inclined to put the INTERFACER 2 to work. In truth, some IMAGINATION and a SCREWDRIVER is all you really need. Anyone able to wire a switch could use this device.

WORSE! There was also the fear of plugging a "foreign device" into the precious computer. This notion has all but disappeared as there are now so many quality products designed for the TRS-80 that plugging in a non Radio-Shack device has become common.

Our ad in Creative Computing (80-Microcomputing did not yet exist) hardly paid for itself.

We had a decision to make. Were we wrong or just too early? Our first INTERFACER 2 was sold to someone who wanted to, and succeeded in, controlling his fancy model railroad with his TRS-80. Interesting, but what made us stick with the concept was that some of our INTERFACERS began finding use in applications with fascinating possibilities. Space is lacking to describe them, but the most exciting was the successful use of the system in assisting a handicapped young boy. We were pleased to hear of such a meaningful application.

Today

Three years later, as you can see in our ads, The INTERFACER 2 is alive and well. The price went up a bit, and despite the introduction of the more powerful INTERFACER 80, the sales have been steady.

Then came the least understood product! the ANALOG 80. This \$139, nicely designed module is an Analog to Digital converter with 8 input channels. Used with your TRS-80, it provides a powerful "data acquisition system". This jargon simply means that you can monitor, measure and record 8 independent varying voltages. Very few people realized its real power. Such a system would have cost over ten thousand dollars just a few years ago.

The possibilities in scientific and engineering environments are endless. This system could replace chart recorders, digital data recorders, programmable calculators, data analyzers and many other specialized and expensive pieces of equipment. Furthermore, up to 8 ANALOG 80's could be used simultaneously for a total of 64 channels of analog input! They simply plug into the TRS-80 using our "X" series of bus extenders (EXPANDABUS).

The idea was simple. We would supply the missing link between the TRS-80 and the "outside world".

Our next product was to be a second generation, Input/Output interface, with more flexibility than the INTERFACER 2. Careful design and refinement yielded the INTERFACER 80, the most powerful real world interface on the market today. It has 8 inputs, each optically-isolated and 8 outputs, each with a relay contact. The INTERFACER 80 is fully compatible with our ANALOG 80, allowing these to be used together in order to create systems that control external devices based on "sensed" input under control of the TRS-80.

A FAILURE! In spite of our extensive advertising, very few are aware of the existence of the powerful ALPHA I/O SYSTEM.

The Facts Are:

- The ALPHA SYSTEM/TRS-80 combination forms an incredibly versatile and powerful tool for acquisition/processing/control.
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- The entire system can be easily programmed in BASIC using INP(X) and OUT X,Y commands.
- The modular approach and our EXPANDABUS allow for instant expansion as requirements demand.

The following pages contain more information about the devices mentioned here. We invite you to call or write to discuss your particular application.

Device descriptions; **NEXT PAGE** ➔

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Neat, Compact Design
3 Years Battery Life

Slips Inside E/I
(Y Option Shown)

Real Time Without
Expansion Interface

•Complete, self contained "true" real time clock/calendar, TIMEDATE 80 continues to keep accurate time and date when the computer is turned off or experiences a power failure.

•TIMEDATE 80 only needs to be set once, and it's two replaceable "AAA" batteries (not included) keep TIMEDATE 80 running in excess of 3 years. Costly Ni-Cad batteries and charging circuits are eliminated.

•The instant power is applied to the TRS-80, TIMEDATE 80 provides MO/DATE/YR, DAY of WEEK, HR:MIN:SEC and AM/PM information with quartz accuracy.

•TIMEDATE 80 replaces the computer's internal clock. Extremely useful for automatic operation of remote systems with no operator in attendance. If the power fails and then is

WHY LOSE PRECIOUS TIME ?

restored, only TIMEDATE 80 will update the system with current TIME and DATE information, an impossibility with the computer's internal clock.

•TIMEDATE 80 is quartz crystal based with INTELLIGENT CALENDAR, including provisions for leap year! TIME display may be by 12 hour AM/PM or by 24 hour military and European format.

•TIMEDATE 80 plugs directly into the rear of the TRS-80 keyboard and gives the "TIMES" function even without an Expansion Interface. For those with a disk system, it plugs into the left side panel of the Expansion Interface. An optional "Y" connector can provide for further expansion.

•TIMEDATE 80's small size keeps the computer table uncluttered. 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—"TIMES" and "TIMES"; "TIMES" is a step by step set of simple instructions for setting TIMEDATE 80. "TIMES" is a set of poke routines which patch DOS and 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!

•Other valuable uses for TIMEDATE 80 are: accurate date and time information for business reports like payroll records, financial reports, etc., or to various I/O devices requiring 24 hour clock input, such as laboratory instrumentation, and to communication systems needing "Log In/Log Out" data (bulletin boards).

•TIMEDATE 80, fully assembled and tested, 90 day warranty, complete with instructions and software on cassette, \$95.00 "Y" option, add \$12.00.

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Structured Basic and Beyond

Wayne Amesbury
Computer Science Press Inc.
Softcover, 310 pp.
\$10.95

by John W. Liskey

How many times have program writers—novice and experienced alike—been admonished to design a program before committing a single statement or instruction to paper? In spite of this, how many succumb to that urge to reach for the coding form and gleefully write code off the top of their heads? And how often does this lead to gibberish, requiring hours of toil to debug?

In the early days (a couple of years ago), it may have been practical to make a program an individual work of art. Devoted hobbyists could afford to spend hours getting a tortured jumble of statements to execute properly. This is no longer a luxury business can afford; nor does it make any sense with the development of the structured approach to program design.

In *Structured Basic and Beyond*, Dr. Wayne Amesbury presents an approach making it possible for students to grasp the concept of designing a program before going anywhere near a keyboard. Professionals will find this book a new way of life if they have never seriously looked into structured design before.

Dr. Amesbury presents pseudo-code as the primary designing aid. At no time is the discussion bound by any one version of Basic. The underlying principle of the book is to avoid imposing a particular version on the student. For this reason, there is a philosophical basis throughout the book completely independent of any language. From this book, anyone can progress to an understanding of Cobol, Fortran, PL/1, Pascal or Algol without difficulty. This book is not written only for the person who wants to understand the logic and process of a program. It causes one to understand structured design by simply following and trying the beautifully clear explanations. If any point is emphasized, it is the desirability of designing programs that are portable from one sys-

tem and language to another.

While the theme of this book is structured design, you should not jump to the conclusion it might be vague on the practical applications of Basic. Dr. Amesbury follows each pseudo-code demonstration with examples showing the relationship between pseudo-code and Basic statements. He has also gone to great lengths to point out differences between the many

mini-era. Some programmers will view this with sadness, for they have traditionally winged it, writing line after program line, trying to figure out their program after trying to run it. The person emerging today in professional program design and development is one who never goes near a computer until his or her program has been completely designed and walked through; one who makes certain anyone else can

“... if you want to write professional programs, (this book) will open your eyes to a philosophy... of incalculable value.”

versions of Basic, often illustrating how the same problem may be solved in different versions. The key element to solving these problems is understanding the logic, so when a different version is encountered, you can easily make the conversion and be on your way.

Today we are seeing the passing of a

follow his or her program design; one who is sold on the structured design concept.

If you enjoy debugging a convoluted program, this book could ruin your life. But if you want to write professional programs, it will open your eyes to a philosophy and approach of incalculable value and benefit. ■

**Introduction to PASCAL
Including UCSD PASCAL**
Rodney Zaks
Sybex Inc.
Softcover, 422 pp.
\$8.95

by Dennis Thurlow

While relaxing at the local inn I chanced to hear two fellow students speaking. One explained to the other the simplicity of learning programming with the help of Pascal. Being quick witted, and knowing the pay scale in the computer field, I decided to find out who this Pascal was.

I bought a copy of *Introduction to Pascal* by Rodney Zaks, a “tutorial and reference text,” according to the author. By confining myself to a comfortable chair and following the advice given in “How to Read This Book,” I was able to complete the introductory chapter with ease. The exercises seemed simple enough, so I continued, with only occasional help from

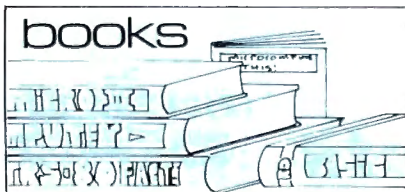
a dictionary, through chapter six.

My understanding of computers, programming, Pascal, and the potential of the field were sufficient, at this point, for me to keep on reading without any problem.

Further excursions into the book taught me about data types, files, arrays, and sets. (I still keep the book close by, as the appendices, syntax charts, and examples make it an excellent reference manual.)

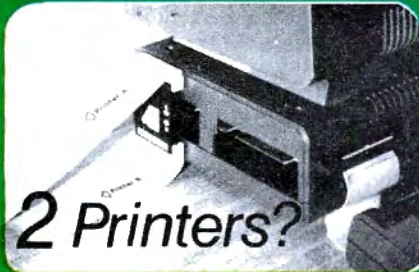
Before completing my studies I learned of a new, interactive version of my old friend, called UCSD Pascal. I could now talk directly through a keyboard and get my answers immediately! The book was again helpful, with separate discussions in each chapter on implementing the material in the UCSD version, and an appendix on handling UCSD interactive files.

Sample answers to the programming exercises are given, the publisher is dedicated to updating any errors, the book is well indexed, and though the cover may only shine like silver, the contents glitter like gold. ■



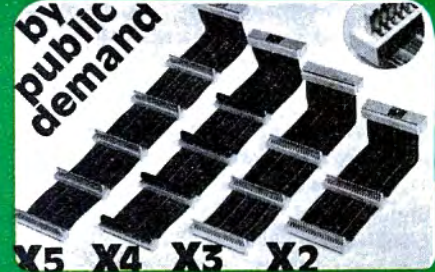
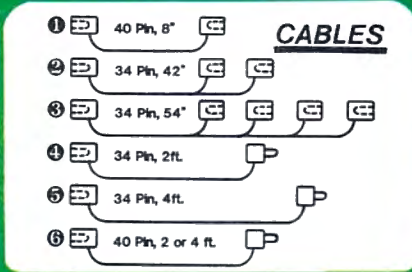
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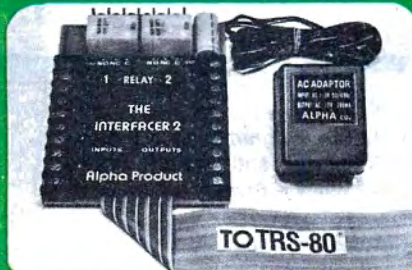
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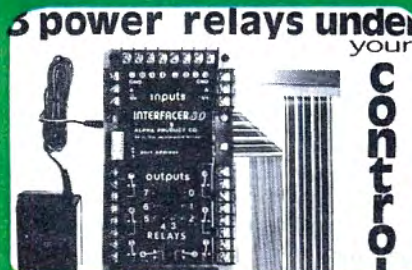
GREEN SCREEN WARNING

IBM and all the "biggies" are using green screen monitors. Its advantages are now widely advertised. We feel that every TRS-80 user should enjoy the benefits it provides. But **WARNING:** all Green Screens are not created equal. Here is what we found:

- Several are just a flat piece of standard colored Lucite. The green tint was not made for this purpose and is judged by many to be too dark. Increasing the brightness control will result in a fuzzy display.
- Some are simply a piece of thin plastic film taped onto a cardboard frame. The color is satisfactory but the wobbly film gives it a poor appearance.
- One "optical filter" is in fact plain acrylic sheeting
- False claim: A few pretend to "reduce glare" In fact, their flat and shiny surfaces (both film and Lucite type) ADD their own reflections to the screen.
- A few laughs: One ad claims to "reduce screen contrast" Sorry gentleman but it's just the opposite. One of the Green Screen's major benefits is to increase the contrast between the text and the background.
- Drawbacks. Most are using adhesive strips to fasten their screen to the monitor. This method makes it awkward to remove for necessary periodical cleaning. All (except ours) are flat. Light pens will not work reliably because of the big gap between the screen and the tube.
Many companies have been manufacturing video filters for years. We are not the first (some think they are), but we have done our homework and we think we manufacture the best Green Screen. Here is why:
•It fits right onto the picture tube like a skin because it is the only **CURVED** screen **MOLDED** exactly to the picture tube curvature. It is Cut precisely to cover the exposed area of the picture tube. The fit is such that the static electricity is sufficient to keep it in place! We also include some invisible reusable tape for a more secure fastening.
•The filter material that we use is just right, not too dark nor too light. The result is a really eye pleasing display.
We are so sure that you will never take your Green screen off that we offer an unconditional money-back guaranty: try our Green Screen for 14 days. If for any reason you are not delighted with it, return it for a prompt refund.
A last word: We think that companies, like ours, who are selling mainly by mail should list their street address have a phone number (for questions and orders) accept CODs, not every one likes to send checks to a PO box offer the convenience of charging their purchase to major credit cards. How come we are the only green screen people doing it?
Order your **ALPHA GREEN SCREEN** today... \$12.50



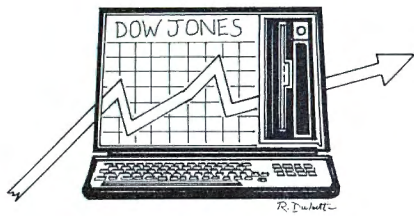
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New Uses for the Home Computer in the Stock Market

Thomas V. Lenz
 Spring Creek
 Elko, Nevada 89801
 Softcover, 254 pp.
 \$19.95

by Dave Smith

Are you looking to improve your score in the stock market? Would you like to have an edge over the experts on Wall Street? Thomas Lenz has provided the means for you to do so in this fascinating collection of 34 Level I programs for the TRS-80.

Possessing a degree in business administration and more than 20 years experience as a securities broker, the author has developed these programs over the course of seven years, borrowing from the field of physics the methodology of hybrid analysis and applying it to the field of stock market timing.

The Truth Behind Myths

The book explores the analysis of both short (seasonal) and long-term cycles in the market, using data which has been collected over the course of 96 years and which are available to everyone. Using the personal computer as a sophisticated tool, Lenz demonstrates the truth behind numerous market myths and shows you how to quantify business cycles that are unknown to many expert market analysts.

The book presents the 34 programs with a textual explanation of each. The programs are progressive, with each succeeding unit built upon previous ones. Typical programs run average, percentage series, statistical oscillograph, strong cycle test, random trading test, upper limit of earnings, statistical resonator (for locating cycles), statistical wave filter and extensive statistical analysis. The text accompanying each program is clear and well presented. Lenz details the creation, function and significance of each program as it is presented. A glossary provides clarification of unfamiliar market and mathematical terms.

The programs which are central to the purpose of the book let you create, edit

and duplicate data files. Computer sophisticates will deplore the use of the lowly cassette tape as the data file storage medium, but Lenz makes no apologies for its use. Since all programs are designed to operate within 16K of memory (and most within 4K), the use of a cassette is appropriate.

From Level I to Level II

The programs are printed in large, easy-to-read type, making them easier to type in. Two problems arise, however, concerning the format of the programs themselves. The first is that they are all written in Level I Basic. The best estimate I can find says that only between three and five percent of the TRS-80s sold operate on Level I. That leaves several hundred thousand potential users of these programs who will be required to translate the programs into Level II.

The author in response to this problem included in the book, a Level I to Level II translation guide which is where the sec-

ond problem arises. The guide is seriously deficient in dealing with Level II array definitions (no mention of the DIM statement requirement) and does not comment on the translation of logical operators at all. Only those benighted individuals who, like me, moved to Level II after mastering Level I will recall that in Level I "*" and "+" are the equivalent Level II operators And and Or. Level II users who are not programmers are likely to be severely disappointed to find, after translating and entering some of the more extensive programs, that the programs either do not work or worse, that they provide erroneous analysis.

Translation problems notwithstanding, Lenz has certainly provided in this book all the justification needed for purchasing a personal computer. Whether you are a stock market amateur seeking to broaden your knowledge or a daily trader on Wall Street, you can only enlarge your understanding of business cycle analysis through reading and applying this book. ■

Data File Programming in Basic
LeRoy Finkel and Jerald R. Brown
 John Wiley & Sons
 New York, NY
 Softcover, 338 pp.
 \$9.95

by Hal Knippenberg

Have you ever wished someone would write a book about Basic offering more than a simple introduction to the language—a book for those of you already writing simple programs that would teach you more advanced programming tricks?

Two well-known educational consultants on computers, LeRoy Finkel and Jerald R. Brown, have done just that. Their new book, *Data File Programming in Basic*, is a self-teaching guide for using data files with your microcomputer. This book explains data files used in TRS-80 Microsoft and Northstar Basic. And the explanations are simple enough to be applied to other versions of Basic with little effort.

Although not written for the novice, this publication begins with a review of key Basic programming statements. Because the authors believe programs should be readable by computers *and* people, they show several ways to use "prettyprint" to improve program clarity. They believe in organizing programs from top to bottom and using many remark statements to ex-

plain program logic and make it into modules. Their review of Basic statements is notable because it concentrates on string and substring statements. Strings are seldom covered thoroughly in introductory books on the subject, but are essential to the effective use of files.

After their excellent Basic review. Finkel and Brown focus on writing data file programs. They show how to build data entry and error-checking routines—especially helpful information considering most program errors occur at data entry time.

*“Sequential files
 are ideal
 for cassettes.”*

Once error-free data entry is mastered, the authors show how to create and read back sequential data files. From this point on, you can write programs using more data than your computer has memory. Your disks or cassettes become a working extension of your computer, not just a means for storing programs.

The skills mastered working with se-

quential files are used to help you build utility programs. You learn how to write programs for copying files and for adding, changing or deleting file data. You even learn to combine data from more than one file.

Many of you do not have disks, but are able to put data on cassettes. Sequential files are ideal for cassettes, and chapter six is devoted entirely to cassette data files.

The book completes your data file edu-

cation with a thorough discussion of random access files. You learn how to create, verify, copy and change random access disk data files. You also learn to write programs that will convert sequential files to random access files.

The final chapter, "Random Access File Applications," shows several ways to use your new-found skills. One very useful technique utilizes sequential pointer data files to index large random access files. By the time you master this technique,

you will be writing quite sophisticated data file programs.

This is the first book I have read that shows how to write effective data file programs. After studying this publication, you should be able to write these programs with ease, modify any commercial programs, and adapt data file programs found in computing magazines. In short, I think *Data File Programming in Basic* is an excellent book and well worth your study. ■

The Small Computer in Small Business A Guide to Selection and Use

Brian R. Smith

Hardcover, 144 pp.

The Stephen Green Press

Brattleboro, VT

\$12.50

by Bert Latamore

80 Microcomputing staff

Author Brian Smith promises that his book, "requires no prior understanding of computers or computer terminology. It is written for those who want to know how a small computer can help them run a business successfully."

Smith fulfills this promise and has written a book belongs on every small businessperson's reading list.

Smith focuses completely on the issue at hand. Except for one excursion into a brief explanation of computer electronics, he avoids talking about technical subjects that are not directly involved in the use of computers in small businesses. When he does use a technical term it is one that cannot be avoided and he carefully explains its meaning and significance to business.

He educates the reader to all those computer issues and terms needed so that the business person can talk with computer store personnel on an equal footing. Smith also provides a glossary of technical terms in the back of the book for handy reference.

All of this is relayed in a solid journalistic writing style which is unfortunately rare in computer literature. As a result, the book is extremely easy to read.

Definitions

Smith starts his book logically with a discussion of what a computer is and what it is not. He points out at the start that the computer "is nothing more than a very fast, very dumb, adding machine."

He also points out that the computer almost never makes a mistake, that the mistakes are almost always made by the programmers and operators. This point illustrates one of the basic issues he takes up later in the book; the businessperson has to know exactly what he wants to accomplish with a computer.

Smith spends his second chapter giving the reader a look at how the computer works. He explains base 2 math and why it is used in computers, and he discusses OR, AND, NOR and NAND gates, half adders and the like.

This is the one place where Smith really does get more technical than he probably needs to be. The more technical aspects of this chapter, particularly the wiring discussion, would probably have been better placed in an appendix or left out altogether. However, since he never refers to the circuitry again in his book, the reader does not really have to understand this bit of wiring technology he discusses.

Do not skip the whole chapter, however. He does explain what a central processing unit is, how the size of its main memory is measured and what that means to the business user. He discusses input and output devices, floppy and hard disks, tape storage and the usefulness of each.

Once through these basics, Smith defines data processing and discusses how this is accomplished with the computer. He works with the simple example of a payroll clerk equipped with a calculator and typewriter and discusses exactly what data the clerk will need and how to calculate it to determine employees' pay. Smith then diagrams the steps in a simple flowchart. He gives a chart showing exactly how the computer would handle the same task from the reading of time-card data to the printing out of the checks.

Machine Capacity

Smith then introduces one of the important themes in his book: machine ca-

capacity, which he returns to several times throughout. He states that one of the most common errors is to underestimate a small business' computer needs. He strongly advises the businessperson first study the business carefully to determine exactly how much data the machine needs to handle. Then Smith advises him to buy a machine that has at least twice that capacity or one which can be easily expanded to allow for growth of the business.

He points out that a computer will represent a large up-front expense for a small business and it will only pay for itself over time. If the business outgrows a machine in a year, that machine has not paid its way.

Software

In chapter 3 Smith starts with the basics—what software is and why it is needed. Smith again avoids confusing the beginner by presuming the reader has no knowledge of a microcomputer and its operation.

Smith goes on to discuss operating systems, particularly CP/M, compilers and interpreters. He also briefly discusses Fortran, Basic, Cobol, Pascal, PL/1 and C. These discussions are extremely brief—he devotes one paragraph to each of the last three. He makes no attempt at teaching the reader to program. He points out that there are many good books on the subject already available. Beyond that, he recommends that the businessperson avoid learning to program, and he warns that a businessperson who spends his days figuring more elegant ways to have his machine perform mathematical calculations is not spending his time on the computers doing what he should be doing—running his business. The computer can become an expensive and very distracting toy.

Chapter 4, "The Coming of the Computer in Small Business," is a summary,



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and represents a study done by Bob Vitelli, a former student of Smith's at Franklin Pierce College in Rindge, NH. The chapter presents the rationale for the book which, Smith says, was inspired by Vitelli's survey of the attitudes of small business owners towards computers.

"The entire Vitelli study pointed out the need for knowledge and information. In many cases, either the information that business owners had about computers was insufficient, was misleading, or both. This book was written to dispel some of the myths that the study found business owners have about computers, and to provide some basic knowledge so that intelligent questions could be posed by business owners before a decision on a computer is made," Smith wrote.

In chapter 5, "Applications," Smith discusses which application programs are available and what to do if you need one that is not.

Smith starts by pointing out that while too often the businessman interested in computerization buys a computer, then buys software, and finally tries "to shoe-horn both the hardware and the software to fit the business," the sequence of events should be just the opposite.

Smith says the first step should be to "define what it is within the business that needs automating." Then find software that will handle the jobs you have and finally find a machine that the software will run on.

Therefore, Smith starts the chapter on software with a discussion of those areas of business that are susceptible to computerization. He concentrates on the basic financial areas of receipts and disbursements, accounts receivable and billing, accounts payable, inventory control, budgeting, customer mailing lists and payroll.

Smith goes on to explain exactly how to discover how large a file each will need, using the simple example of an employee file for a firm with 15 employees. This is very important since the software and machine the company buys must be able to handle various size files.

He then defines the four sources of software: turnkey systems, packaged programs, learning-by-doing with kits, and custom written material. He explains the importance of error messages, warranties and program maintenance contracts.

Having examined the relative merits of all these approaches, Smith proceeds to a detailed analysis of the basic business functions. He explains the correct procedures involved for each using flowcharts and sample ledger pages, and examines the ways that the computer approaches

each job. He explains what the effect of computerization will have on the accountant's work load and gives some idea of what amounts of money the average business can expect to save on each task because of computerization.

Chapter 6, "Justifying a Computer for Your Business," was my one major disappointment in an otherwise excellent book. I had hoped for a cogent discussion of the various financial issues involved in determining the cost effectiveness of a small business computer.

While each business is different, and no hard rules can be made to cover all of them, I am sure there are good methods for analyzing just how much a computer will save in terms of time and money in various applications of business. And I am sure there are good rules of thumb concerning how large a small business should be before it considers computerizing. Of course these are usually estimates, but they are important guides in making the decision on whether to computerize.

Instead of discussing these in a meaningful way, Smith took the attitude at the beginning of the chapter that he had never seen a feasibility study that was not biased in favor of buying a computer. Therefore, he said, in essence, that the businessman will base his decision to computerize on his feelings even if he has hard data to go by, and any study will automatically be designed to do nothing more than justify those feelings.

My contention with this chapter is that, if I were a business person I would want to know exactly what I could expect in costs versus savings before I put a penny down.

Summary

I strongly recommend this book to businesspersons, computer technicians and students. If you do not have a computer you stand to learn a great deal about how they may help you if you are in business. Those with machines may well learn how to better utilize them. Computer technicians in general, and especially computer salespeople and programmers working for the business market, can also learn from this book because it explains basic business issues using the computer as an aid.

Finally, it can be a good book for the person interested in a home computer but not necessarily interested in computers as a hobby. Although the book discusses business issues, much of its material is directly applicable to the home on a smaller scale. ■



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Morse Code, Baudot and ASCII Radio Teletype Programming for the TRS-80 Model I and Model III Microcomputers

Richcraft Engineering Ltd.

Chautauqua, NY

Softcover, 276 pp.

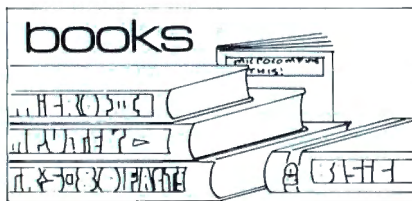
\$18

by Dr. William M. Laird

Here is a book that will turn the hair white of firms selling Morse code and radio teletype Assembly programs for the past few years for \$149 and up.

As only a modestly experienced Assembly programmer, I found the expanded commentary in each chapter, plus the object code and source code printouts with comments for each program extremely helpful in understanding the programs' logic and flow. These programs are definitely not for the beginning Assembly programmer, who must learn the difference between a JR and JP instruction, but they are easy to follow if you have read this publisher's self-programmed learning series of books. (*Disassembled Handbook for TRS-80*, Volumes I, II and III. This book is actually Volume IV of the series.)

The authors have simplified following the program flow by using a minimum of jumps. The logic is straightforward for each program. The programs have been designed so that once loaded from cassette or disk, the average radio amateur can master their operation with minimal practice.



Chapters I-IV tell you how to generate perfectly timed Morse-code, something seldom heard on amateur bands. For transmission speed, one inputs the words per minute desired. For reception speed, the operator is asked to input two numbers corresponding to dot length and typical space length. This may sound difficult, but it is quite easy to master. The two inputs allow the reception program to accommodate swing fistlers—amateurs sending less than perfectly timed Morse.

After about 30 minutes practice, I could not find a station whose Morse the program could not copy. The merged programs use the cassette-in line to copy

2,000-cycle audio from the station receiver, the cassette-out line to drive a 2N2222 transistor. That device keys the station's transmitter key jack with TTL logic, and the cassette motor control relay (through a buffer relay) to control the stations transmitter/receiver and antenna relay, when switching from transmit to receive with the Clear key.

Chapters V-VII are worth five times the price of the entire book. Having been a radio teletype buff for many years, I've finally found a home. Gone are the whirring and clanking machines of past times. All the operator does is tell the program the equivalent Baudot speed desired and nearly everything else is automatic. The clear key is the T/R switch.

The book includes 22 prepared messages may be called from the menu by pressing shift and the up arrow in the transmit mode. If you do not wish to look at the menu, then just press the up arrow and the letter for the message desired. transmit mode. If you do not wish to look at the Menu, then just press the up arrow and the letter for the message desired.

Chapters VIII-X are similar to programs found in Chapters V-VII, except for 110-Baud, eight-bit ASCII code instead of five-bit Baudot code. If you study and enter the programs in Chapters I-X, you should have earned your master's degree in code conversion, as you will have mastered a number of difficult subjects.

Further Notes

None of the programs in this volume require the RS-232C interface unit for the Model I or the Model III, since they generate their own serial to parallel and parallel to serial conversion.

For the programs in chapters V-X, a digital port interface (such as the Design Solution AN-511, Telesis VAR/80 or Alpha Product Interfacer 2), is required. All work with or without the expansion interface on the Model I, and with the adaptor on the Model III.

Nearly all available memory is grabbed by EDTASM. This program details an interesting approach to writing a mini-program in low memory, so your printer prints out 64 characters or spaces per line.

The book covers using an adaptor, allowing the use of almost any Model I ancillary port operated device (40-pin connector) with the Model III (50-pin connector). Only one active TTL chip is necessary to switch the I/O bus from output to input, plus the 40- and 50-pin connectors.

Ever wish you could start printing an editor/assembler program being assembled at any line without starting at the

"None of the programs require the RS-232C interface."

beginning? A simple 39-cent modification described in the book may be installed in about 10 minutes and does the job very efficiently.

A demonstration program allows you to generate the 2125-cycle radio teletype mark tones and 2295-cycle space tones with software rather than a terminal unit. It uses only a single chip transducer from Alpha Product Company. The program outputs the radio teletype test signal RYRYRYRY from the transducer at an equivalent speed of 60 words per minute.

A fascinating, yet short, program prints out the speed in equivalent words per minute of any Baudot radio teletype signal being received—60, 66, 75 or 100 speed. It also tests for 110 or 300 Baud ASCII RTTY.

Summary

This is a teaching text and a book full of functional, working programs for the radio amateur and computer buff who would like to use his TRS-80 to communicate with the fascinating world of ham radio. All programs are divided into individual transmit, receive and combined chapters to allow the reader the opportunity to assimilate the concepts being presented in reasonably sized bites, rather than choking to death with too big a mouthful. The programs may be used as is by inserting only your call letters, name and address in the appropriate prepared message locations with the Radio Shack Editor/Assembler.

All three transmit/receive programs are available on two 35-track disks, though this book is also required for operating instructions. On special order, Richcraft will insert your call letters, name and address in the proper locations of all three transmission and reception programs for Morse, Baudot and ASCII RTTY.

The appendices are extremely useful and could have been the subject of another volume.

Volume IV deserves an excellent rating and should be invaluable to any microcomputerist who wishes to understand the concepts of code conversion and use the TRS-80 in telecommunications. ■

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The Creator
Complete Business Systems, Inc.
Chicago, IL
\$295

by Mary S. Gasiorowski

Have you ever invested time and energy in a data management program only to find it did not fit your needs?

Now's your chance, without knowing a bit of Basic, to create your own personalized data management program. Called "the programmer on a disk, for non-programmers and small systems house use," the Creator is a disk-based TRS-80 program which writes Basic programs to collect and manage data. Further, the created programs are modular, well-documented, compact, well-designed and easily modified by the user without knowing the techniques of developing such programs.

Is the Creator really for non-programmers? Well, yes, though for the documentation you may need an interpreter. Here is another example of a good program made difficult by weak documentation. The documentation seems to still be in a rough-draft stage. Page 50, for example, talks about showing the relationship of record size to the number of records on a disk in a table "on the next page"—the table is actually on page 14.

Also, after exclaiming several times that the Creator is not technical, the documentation goes into several somewhat technical and vague discussions on what packed numbers, records and fields are; how many records will fit on a system disk versus a formatted disk; how to calculate (approximately) how many records you can fit on a disk and still allow for expansion; and how to shorten or compress your program.

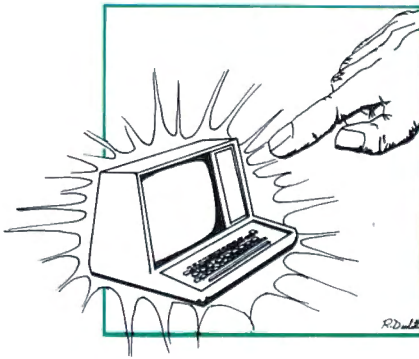
Data Setup

The programs created by the Creator are ideal for handling a mailing list or an inventory of items—any list of information with any combination of numbers and letters.

A handy form is included in the documentation to help you determine the length of each piece of information (field) in the data item (record). For example, in a mailing list, one complete address is a record, made up of various parts, or fields, such as a zip code. You might allow the last name field a length of 15, the address field 20, the state field only 2, etc. Also using the form, you decide the order in which you want the data to be entered—such as last name first or first name first.

Another major planning step is to determine what checks (the Creator calls them

edits) you want included in the program to make sure the data typed in is the proper information. To go back to our mailing list example, it is wise to make sure the zip code is not omitted, or that it has exactly five numbers and no letters. Some of the other things that can be checked for are numbers or letters within a certain range, all numbers or all letters, and inclusion in the data of a certain combination of numbers or letters or both.



You must also indicate the key field, the section (field) of data which determines where in the entire list of data each record should be. In our mailing list, the key field would probably be the last name, so that the mailing list can be sorted by alphabetical order.

Running the Creator

Believe it or not, running the Creator is as simple as typing Run Creator and answering some questions about your data.

Type in a file name for your created program—this is the name you will call up to run your program—and a title to appear on the screen.

Then you will be asked for an exit code. When your program is running and the user is typing in information, typing the exit code lets the program know to stop what it's doing and return to the menu. A common exit code is the word End.

The next step is to describe the data fields. First the length of each field is entered. The Creator keeps track of how much room is left—if you make a mistake, you can reenter the length. Next, indicate which is to be the key field. The Creator will then display information on the types of data and checks you can use.

The Creator will review your outline of data fields, reminding you of the length, and ask you for a prompting message for the user, the kind of data, and the checks you want to use on that data.

In a mailing list, a prompting message for the last name of the addressee might be: "Type in the addressee's last name."

The kind of data can be any character: numeric, numeric and integer (whole numbers between -32767 and +32767), numeric to six significant digits, or numeric to 16 digits.

Finally, enter the checks you want on the data and any messages you want to appear on the screen if the checks fail. For example (our mailing list), if you are looking for a last name, you want to check for No Entry (hitting the enter key without typing in anything), Not Alpha (any numbers instead of letters), and perhaps Length >15 (to restrict last names to 15 characters). Each check produces its own error message; for example, if a last name has 16 characters (flagging the check Length >15), you might have the message, "Please shorten the name to 15 characters."

The Creator will proceed through all of your data fields, and then suggest a way to end your data collection program.

In this way, you can set up what kind of data you want and what the computer should do if the data is incorrect, without knowing any Basic programming. Once you have run the Creator to create a program, you need only load and run your new program.

The created program is well-designed, easy to modify, well-documented by remark statements, modular and efficient; it is easy to use because it is menu driven and incorporates error trapping. You can update or amend your data files by choosing that option in the menu. You can change one data field without having to delete the entire record.

The Creator is an easy and inexpensive alternative to hiring a consultant to develop data management programs. It is worth the effort to work through the documentation to create a personalized and useful program.

The Reporter

With the Creator came the Reporter, a program which generates programs to write reports. You can set the title, column headings, tabs, column and field relationships (such as column(5) = column(2) + column(4)/2), subtotals, totals, pagination and whether you want the report sent to the screen or the printer. The Reporter is very flexible in its handling of data; for example, if you want to exclude data below a certain range, you can say, "If Column(3) < 10 Then Skip." Just as in the Creator, use of the Reporter requires no knowledge of Basic programming to develop a useful, personalized program.

As in the Creator, you must give a file name for your report program, as well as a title to appear on the screen. You must also determine whether you want the re-

port on the screen or the printer. Unfortunately, the Reporter is not capable of showing the report on the screen, verifying it with the user and then sending it to the printer. (This is one change I suggest the author make for his next version of the Reporter.)

Then type in the name of the data file you want used for the report (don't forget the extension /DAT if the file was created by your data program created by the Creator). Specify the record length of your data—refer to the data form you used for the Creator—then describe the various field lengths.

You can then set the column headings for your report. Note that the number of columns may be different than the number of fields of data, since a column may be defined as a combination of fields or as just part of a field. For example, two data fields may be the number of items in stock and price per item. Two columns may exactly reflect that data, and a third column may be the product of those—the value of the inventory.

You need to plan ahead for the tab settings for the columns. Use a piece of graph paper to determine how much space to set aside for each column. And don't forget to set aside space for left and right margins.

The Reporter will number your pages, if you want, as well as putting the title and column headings on each page. The documentation claims you can have up to 999,999 pages, if you live that long and are that patient, though I only tried five pages.

Type in the type of data in each of the data fields, then describe how the columns are related to these fields. This is similar to setting up the checks or edits in the Creator. You can set a column to be exactly equal to a specific field, or any algebraic or trigonometric combination of any numeric fields or columns. Character (alphabetic) fields can also be manipulated; fields can be reordered, combined or split up to define columns. For example, in a report based on our mailing list, where the last name is in data field(1), first name in field(2), and middle initial in field(3), you can define column(1) as follows: $\text{column}(1) = \text{field}(2) + \text{field}(3) + \text{field}(1)$. This would print out the name in correct order in column one in the report. A column can also be defined as part (left, middle or right part) of a character field. For example, if field(5) contains area codes and telephone numbers (and is defined as character not numeric), a column for the area code can be set up: $\text{column}(3) = \text{left}\$(\text{field}(5))$.

The variable V and combinations of it

are reserved for saving subtotals and totals. If you want the total of field(6) for all the data, you might define $V2 = V2 + \text{field}(6)$. You will be allowed to print any totals at the end of the report.

The Reporter is not as well developed as the Creator. The screen/printer routine should be improved to offer both, and the tab setting could be done automatically by the program after you specify the column headings. The Reporter is not as easy to use as the Creator, and it does use many more Basic terms and commands,

and so, requires more from the user.

The Creator is worth the effort (don't get bogged down in the documentation—just run the program). The Reporter is unnecessarily difficult and lacking in several useful features. By the time you figure out the Creator, you may be able to tackle the Reporter. The idea behind these programs is good. Each is not just a single program, but a creator of programs. Perhaps by the time you read this, the author will have revised these programs to make them easier to use. ■

Computer Acquire
Microcomputer Games, Inc.
Avalon Hill Game Co.
Baltimore, MD
\$20

by Mary Gasiorowski

Have you ever imagined yourself a financial wizard, the head of a vast hotel chain involved in power struggles and stock mergers? Do you like exciting, fast-paced games? Then keep looking—this is not the game for you.

Computer Acquire is the microcomputer version of the board-game Acquire. There are three versions on the cassette tape: TRS-80 Model I (Level II), Apple II, and Commodore Pet 2001—all require 16K RAM.

Computer Acquire is a game of high finance—a game of strategy and luck, in which from zero to six players can partici-

*“Computer Acquire
is a game
of high finance.”*

chains will give someone a profit, with a bonus going to the majority stockholder.

The game ends when all the chains are merged together or are too large to merge. The hotels and stocks are then cashed in, and the person with the most money is the winner.

Does it sound complicated? It is. The instructions suggest that the game will take two hours to play. It does.

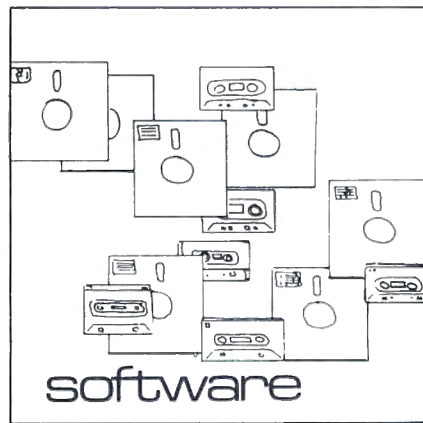
I played Computer Acquire on the TRS-80 Model III (it is compatible) and the Apple. It seemed fairly well debugged. If you answer a question with an absurd number or letter, you are asked to try again.

Why was this board game put on a microcomputer? Oh, the game is okay, but little attempt was made to take advantage of the various features of the microcomputer.

You can play the computer, or, if you are a fanatical game watcher (rather than a game player), you can watch the computer play itself.

There are no graphics, no color, no sound. The screen is harder to read than the playing board included in the original (non-computer) version; it is difficult to distinguish the numbers of the squares from the letters standing for hotel chains since there is no spacing between squares. If you really want to play this game, I suggest you buy the board version (\$6 for the board, \$5 for a set of marker tiles).

I hope Avalon Hill finds a new programmer before they convert any more of their games for the microcomputer. ■



pate (including playing the computer and watching the computer play itself). The object is to build and expand hotel chains. At the same time, you can buy stock in any chain to try to get a majority. Merging two

ACCEL2: Compiler for TRS-80 Disk Basic
Allan Gelder Software
San Francisco, CA
\$89

by Bruce Powel Douglass

Machine code instructions can be executed directly by the Z-80. Run-time for programs written in machine code tend to be very fast. High-level languages, such as Basic, make the machine more accessible to the user by being easier to remember.

These languages must also be translated into the machine code for execution. There are two ways to go about this: interpretation and compilation.

An interpreter fetches the Basic instructions that tell it what to do, and changes them to machine code. This must be done every time a statement is executed. And, although it can take a lot of time, there are benefits. Basic programs can be easily edited, changed, and rerun with a minimum of user effort.

A compiler, on the other hand, only translates the program once, so the CPU can execute the program directly. The run-time is shortened since statements are pre-digested into byte-sized bits. But if the program bombs it's harder to debug. For many time-critical applications, however, a compiler is the best choice, even though they usually require large amounts of memory and cost a lot of money.

ACCEL2 is a compiler which offers a unique approach to accelerating execution spend of Basic programs for the TRS-80. Coupled with its low price, its capabilities make it a reasonably good alternative to other options, such as: writing machine language programs, embedding machine-executable code in Basic programs, or spending a lot of money on big compilers.

ACCEL2 comes on a self-relocatable system tape. It loads starting at 18944 and occupies 5120 bytes. To save it on disk, enter Basic2 from DOS and load the tape. Relocate it where you want it to reside, and reboot. Now you can save ACCEL2 as a core image onto disk.

One of the nice things about ACCEL2 is that 16K tape users can now own and operate a compiler that works. Compare that with Microsoft's BASCOM, in which the run-time system alone is over 14,000 bytes!

The lovable aspect of ACCEL2 is that you are free to sell programs you compile with it without having to pay royalties. Microsoft requires nine percent or \$195

per year for programs sold that used their compiler.

To use ACCEL2, you must call it via the USR function. When you load it from Level II, it automatically loads its address into locations 16526 and 16527, so you may immediately call it by `A = USR(0)`. ACCEL2 has the built-in capability to save and load programs to and from disk. If you want to write a self-contained System tape, you must purchase TSAVE for \$10.

ACCEL2 takes the Basic program in memory and compiles certain statements into REM statements with the embedded, compiled code. It leaves the statements that it cannot compile for the Basic interpreter to execute. Thus, it will compile almost all Basic programs without any revision on your part.

This allows the Break key to still work. This is the only compiler that I know (I have three) that has this capability, although they may be simulated in the others. TRON and TROFF, the Trace function, also work, but they only trace the uncompiled sections of the program.

The run-time system is only 1K, and yet ACCEL2 compiles full floating point for elementary operations (+, -, *, and /), as well as single-dimensioned arrays and some string functions.

When you are compiling a program that you don't want to type again, be sure to save a copy. Compiled programs can't be edited. If you enter the edit mode for any line of your compiled program, whether that line is compiled or not, your system will hang up, requiring a reboot or reset, which is very inconvenient. If the compiler sends you a compile-time error message, your program has been destroyed. You must type in New and reload your program.

Error messages are limited, but useful. You may receive one of six messages: SN (syntax error), OM (out of memory), FC (illegal function), NF (Next without For), LS (string too long) or UL (undefined line for GOTO or GOSUB).

The compiler also supports tape or disk I/O, whereas BASCOM only allows disk I/O. This enables you to keep tape files, and use your compiler at the same time.

The program does contain an error in how it reads data statements. After compiling a program that contains data statements, the program will run (all other things being correct). But if you call the same compiled program off disk to run, you will receive an OD error. This is not much of a problem for me since I only have one program with data statements, but it would be a real pain for someone who dearly loves them. It necessitates recom-

piling the program every time you use it.

Compile times are relatively short, except for long programs. A very short program will compile in a few seconds. A 6K program takes five to 10 minutes, and a long program should be compiled while you take your mother out to dinner.

The Manual

The manual is mediocre. It is 11 pages long and contains useful information, but does not go into enough detail. No mention is made of the data-statement error. It does talk some about pitfalls and about speeding up execution.

ACCEL2 does not compile several statements, such as Print, and the transcendental functions, such as LOG, SQR, and SIN. But it will compile double precision for the elementary arithmetic operations +, -, *, and /. This makes ACCEL2 very useful for speeding slow double-precision arithmetic. You can even write approximation routines for double-precision transcendental functions and compile them.

How much ACCEL2 will speed your Basic programs depends on program structure. If your program contains mostly non-compiled statements, execution time will be similar to Basic's. If the major reason for slow execution is comparing and branching, then execution time will be significantly faster.

The manual gives a table for relative speeds of execution for a variety of compiled statements. Integer arithmetic operations are said to run 47 times faster for addition and subtraction, and two to three times faster for multiplication and division. Double-precision arithmetic execution times are much closer to Basic, ranging from 1.5 for addition and 1.02 for division.

The string operations are quicker as well. LEN executes 43 times faster, MID\$ four times faster, LEFT\$ three times faster, RIGHT\$ 2.8 times faster, and CHR\$ almost five times faster.

Summary

In conclusion, ACCEL2 offers an inexpensive, and efficient method for decreasing run times for general Basic programs. Tape and disk I/O are supported, as well as double precision. Rewriting is not necessary, although execution speed may often be enhanced by writing more optimal Basic code. Its only real problem is in its execution of Read statements when executing compiled programs called off disk. (If someone does discover the correction for this error, please pass it on.) ■

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In Memory Information 3.0
Tandy/Radio Shack
Fort Worth, TX
\$19.95

by Fritz Milhaupt

Radio Shack has been selling its In Memory Information card filing system since the TRS-80's introduction in 1978. Since then many versions have been offered, the most recent being version 3.0 released last fall for Models I and III. It is a fairly good system and lacks nearly all of the bugs of the earlier versions.

The In Memory Information System is based on storing information on pages of memory referred to as *cards*. Each card may contain up to 14 fields of one line (41 characters) each definable by the user. The card has a maximum length of 255 bytes which somewhat limits the amount of data per field. In some applications it may be necessary to break up some entries into two or more cards. This can pose a problem if the cards are sorted later.

This package consists of three programs: the Initialization program, the Sort program, and an Update and Retrieval program. All are written in machine-code.

The Initialization program sets up the number and the length of the fields and creates the initial data file. During the card formatting procedure, the program asks whether to justify short entries to the left or to the right. Unless left justification is specified, leading blanks will have to be included in search strings when using the Find function later on when using the Update and Retrieval module. This is not mentioned in the manual.

The Sort module serves three tasks. It sorts the file in ascending or descending order to user specification, it prints the data file on optional 80-column parallel printer, and it can also split a long data file into two or more sections to avoid over-running available memory.

The Update and Retrieval program is the most used of the three in this system. With it you can add, delete, or update the data cards. Updating can be quite tedious. First the card is found (manually or using the Find command) and the Update mode is entered. The entire card may now be updated. To skip a line that you do not wish to change, hit Enter and the cursor will drop one line. To skip more than one line, hold down the Enter key until the cursor reaches the desired line. Once the last line is passed, the Update mode is exited. Since there is no global replace or delete, updating can get quite tiring.

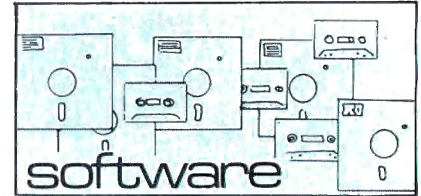
Each program allows for the repetition of key entries by holding down the proper

key until the desired number of characters has been printed. This is something of a mixed blessing since it allows the rapid entry of multiple characters. But if you are a heavy-fingered typer like myself, it is quite an annoying feature, because it acts like a badly bouncing keyboard. The only real operational bug is that if the amount of available memory drops below twice the length of a data card (both of which are displayed constantly), all of the data in memory will be lost because the program restarts.

As a package, In Memory Information makes extensive use of tape files. In order to pass from one module to another, the data must be saved, the desired module loaded, and the data reloaded. Tape data may be saved at 500 baud on the Model I and at 500 or 1500 baud on the Model III. The programs themselves are loaded by their own special loaders.

This program is exactly as Radio Shack advertises, a computerized card filing system. It is possible to save and access great amounts of information with it, particularly in systems with more than 16K

memory. It has potential for those who wish to keep brief records of customer



payment or status in very small businesses. For most small businesses though, Radio Shack's Versafile, which is a shirt-tail cousin of In Memory Information, would be better suited as long as disks were available.

In Memory Information is a good data base for its price, and for most home and hobby applications would probably be adequate. Compared to other data bases in the same price range it ranks favorably. ■

Rats Revenge
Med Systems Software
Chapel Hill, NC
16K Level 2 Models I and III
\$12.95 cassette
\$16.95 32K diskette (Model I)

by Darren DeVigili

What makes Rats Revenge stand out from the many maze games already on the market? It's interesting. Up until now every maze I traversed led to tedium. I never found going from one maze to another very stimulating.

Apparently the author of Rats Revenge felt likewise, as the program is loaded with things its predecessors lacked. Suddenly I'm a rat, with the desire to scurry around, looking about a maze for a morsel of Swiss cheese. I can move one space at a time, run down straight hallways, turn in place (to get my bearings), and even consult a Hint Guru as to my relative location to the maze's main trail. There is also competitive scoring, though obviously only one person can play at a time. (Try to figure out a maze while taking turns.)

Everything I see is in 'rat' perspective. I don't get a top view of the maze until I find the cheese or quit. Oh yes, there is one other way to leave the maze—on little

phosphorescent wings. Not that merely dying is enough, some twisted mind included the dreaded cheese hallucinations.

Besides what you see as a rat, there are assorted messages, some good instructions, and the mysteriously appearing (and somewhat familiar) "hmmmm." Better wait until you see it yourself, no reason to tell you everything. The mazes are randomly generated before each game and take from one to six minutes depending on what size maze you choose. When you either win, quit or starve, the maze is drawn for you and a small dot traces the path you took. Small mazes are drawn with a double-pixel line, large ones with a single-pixel line. Those of you who think it isn't all that big should remember you're inside the maze rather than over it, and you have a limited number of moves to find the cheese.

All of Med's software comes with a two-week guarantee. They don't just guarantee the program will run, they guarantee you'll like it. That's something I appreciate. Who else has the confidence to make guarantees like that? Rats Revenge, as with all the Med software I've seen, is worthwhile. With its well-drawn graphics, total rat perspective, variable skill levels, humorous touches, and more, is one game you won't play once and shelve. ■

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XBE

Computer Applications Unlimited
Rye, NY
\$24.95

by Bruce Powel Douglass

XBE makes editing Basic programs much simpler than any other program of its type. I almost never write or edit programs without using XBE.

Some of its capabilities are selective renumbering of a line or a block of lines, finding the occurrence of any string of characters in the program changing the string to any other string of characters, block deleting lines, definable macro keys for quick entry of Basic commands or oft-used words, page the program, scan the program a line at a time, or jump to any line directly.

The program comes on tape with a relocating loader to place the program at the top of memory, with 16K, 32K or 48K. Once placed into the appropriate memory location, it may be saved on disk as a core image, or on tape with T-Bug. It occupies 5,120 bytes. Once loaded and initialized (with a System command), it may be invoked by entering the command XEDIT.

You must have at least one line to invoke the editor. Once invoked, the editor clears the screen and reformats it, presenting the line numbers in columns zero through seven, and the Basic commands beginning in column nine. No statement will be displayed below the twelfth line, and at the bottom of the screen an area is boxed off. This is for the extended commands mentioned later.

You have a blinking cursor with reasonably complete ease of movement and two speeds to move the cursor along a line using the right arrow. The movement keys are repeating. To backspace (non-destructive), you press the left arrow key. Shift left arrow places the cursor at the beginning of the line. To go to the next line, press Enter. This is also a repeating key. To go to a previous line, press shift up arrow. An up arrow without the shift is a recognizable character, and so it must be accompanied by a shift to move the cursor to the previous line. Shift down arrow lists the next page of your program on the screen.

Editing

When you get to a line you wish to edit, you merely type over the offending errors. To insert characters, use shift I. This will allow you to insert characters until you press Enter. The full page remains visible and the line wraps around as you insert the new characters. To delete, shift D will

do the trick. It is a repeating key, so you can hold it down until you have deleted as much as you want. Be careful though—there is no way to recover characters that have been accidentally deleted. They must be reinserted.

Shift X has the same function it has in Level II editing—it extends the line by placing the cursor at the end of the current line and entering the insert mode.

If you enter the insert mode, shifted characters are now macro keys. They have default strings which may be changed to your desire. Thus you press only a single key to enter Print, LPRINT or CHR\$(. You are limited to six characters with the macro keys.

Clear Command Mode

You have an entire mode called Clear command mode, because it is initiated by pressing the Clear key at the right of the keyboard. The following commands must first be initiated in this manner.

To position the cursor at the first line of the program, press Clear T. To exit the editor and return to Basic, press Clear E. To find a previously defined string, press Clear F.

To delete a line, press Clear D. To insert a line, press Clear I. The default increment is five, but that is easily changed. If there is no room for your line (with the given increment), you will be given the message "No Room Between Lines." You may then renumber the entire program with larger increments between lines, or change the increment for the insert function.

You may mark a statement for a variety of purposes. Clear C marks a statement for copying, while Clear M marks it as a statement to be moved elsewhere (effectively, a selective renumbering of that line). Copy makes a copy of the line where you tell it to, while Move moves the line, thus with the former function, you have two copies of the line, and with the letter, you have only one. Clear H says, "This is where I want the line (or block of lines) moved or copied to." You place the cursor at the line preceding the location where you want the line(s) to appear, and press Clear H.

Clear B is a marker for blocks of state-

ments to be moved, copied or deleted. You mark the first line with Clear B, and then the last line with the Clear command function you wish performed. A square lights up at the lower right corner of the screen to remind you that you have something marked.

More Features

There is also an Extended Clear command mode. You enter this with Clear space bar. The cursor is then positioned at the bottom of the screen. From here you can: change the increment value on lines, renumber the entire program, search for a line number, search for a string, change a character string, or redefine your macro keys. Enter executes the command.

By entering In, where n is a number, you can set the increment value for inserting lines. With Sn, where n is a number, you can look for line number n and position it at the top of the page. You may also use Fstring, which tells the editor to find the first occurrence of string, and the string may be up to 20 characters. Remember, you may invoke Clear F to search for further occurrences of the string. Once the string is located, you may reenter the extended Clear command mode and enter Cstring. This will change every occurrence of the string used in the Find command to the string given in the Change command. The strings needn't be the same length either—the lines will adjust themselves (unless the length becomes greater than 240 characters).

This mode also allows you to renumber the entire program with the extended Clear command Nn1,n2, where n1 is the starting number assigned to the first statement in the program, and n2 is the increment.

Finally, you can enter D(key)(string) and redefine any letter key A through Z to the macro key of your choosing. This macro key may be invoked anytime you are in the insert mode by pressing Shift. Thus it may be used when in insert-in-a-line, X, (extend a line), or insert-a-line modes. You are limited to six characters.

I have used this program extensively since I received it in the mail, and I am still impressed. It is an excellent piece of well written software that is long overdue. ■

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EDAS
Misosys
Alexandria, VA
\$79 Disk

by Paul Weiner

There are several editor/assemblers available for the TRS-80. Each trade-off among conflicting design goals such as mainframe features, size of text buffer, speed, I/O options, flexibility and ease of use.

One way to avoid excessive memory consumption without sacrificing features which require lengthy code is to use an overlay system. With this method, a large program is broken up into two or more smaller parts so that not all the code need occupy memory at anyone time. The most familiar example of such a system is TRSDOS. In editor/assemblers, the simplest application of the overlay approach is to use two main overlays, one for the editor, and the other for the assembler.

Since most assemblers perform more than one pass through the source code during an assembly, the assembler itself can be broken up into several overlays. This technique does offer lots of source space without skimping on features, but the frequent loading of the various overlays tends to make performance sluggish.

At one end of the fancy versus quick-and-easy spectrum is Radio Shack's Editor/Assembler. It supports only tape I/O and does nothing flashy, but is straightforward and easy enough to use. At the other end of the spectrum is Microsoft's ALDS (Assembly Language Development System). ALDS has all the high-level features referred to and more, but is awkward to use, hard to comprehend and slow. Because of these drawbacks, surprisingly few assembly language programmers seem to be satisfied with ALDS, despite its advanced features.

In the middle is a variety of software products. Near the low end are various modifications and upgrades to Radio Shack's editor/assembler. These would include AsPatch, DiskMod, and Apparat's EDTASM. At the high end are completely new products, such as Microsoft's new editor/assembler, and EDAS. I think that for most purposes, EDAS has accomplished the most practical trade-off of design factors, and is currently the best available choice.

EDAS

EDAS, written by Roy Sotoff, is a disk-based editor/assembler. Tape I/O is not

supported. Unlike ALDS, the current release of EDAS does not support macros, relocatable code generation, or conditional assembly. The next release of EDAS, which will be sent free to all purchasers of

“...EDAS assembles directly from disk.”

earlier releases, will implement some conditional assembly and other new features. However, it is unlikely that macros or relocatable code generation will ever be supported. But don't assume that EDAS is not for formidable programming projects. The LDOS operating system was developed on EDAS. And the new releases of Kim Watt's SuperUtility, a 24K machine-language program, were edited and assembled on EDAS.

One of the problems for assembly-language programmers is the size discrepancy between object and source code. Even on a 48K system, a program which assembles down to only a few K of machine language may have a symbol table and source code which occupy more room than is available in an editor/assembler's buffer. This is especially true if the code is highly commented and labeled. ALDS' relocatable module generation solves this problem by letting the author preassemble various segments of his/her program in relocatable form and then having Link-80, ALDS' linking-loader, link them together into a run-time program.

Unfortunately, this usually involves multiple assemblies and seemingly endless disk I/O operations, all at a surprisingly slow disk data transfer rate.

EDAS has a different and remarkably effective approach to many of the problems which ALDS attempts to solve. For instance, EDAS is not organized in overlays. Normally, it's all there in memory at the same time. However, if you're cramped for text space, EDAS' X(extend) command allows the text buffer to overwrite the assembler. This, in effect, achieves an overlay system, since the assembler can be reloaded and run after the source has been moved to disk. But you will rarely need to bother with that procedure because EDAS solves the long source file problem in another way.

Via the Get statement, EDAS assembles directly from disk. One assembly may use any number of Get statements. Thus,

EDAS lets you break your source program into several modules, each of which is stored in a separate disk file. Since a file assembled as the result of a Get isn't actually buffered in memory, a module may be larger than 48K.

If your in-memory source code consists only of a series of Get statements and an End statement, most of your computer's memory is available to hold the symbol table. This solves the source size problem and permits editing and assembling of large programs. It also provides the basis of a subroutine library management system.

In fact, if there are no ORGs in any of the Get modules, they will all be sequentially arranged in memory relative to the ORG in the text buffer. In essence, this arrangement achieves the same effect as does ALDS' relocatable code generation, except that the relocatable modules exist in the source state instead of the object state.

The EDAS assembler also accepts a View (filename) command which causes it to display the requested disk file on the video screen. This allows you to make sure you are Getting the right file. And to further enhance its disk utility, EDAS allows viewing disk directories (including file size allocations and free space) and killing files without leaving the editor.

Other Features

Three other nice features of EDAS have a synergy which results in a breakthrough in debugging ease. I am referring to the /IM assembly switch, the Branch command, and EDAS' warm start capacity. The /IM/ switch lets you assemble a program directly into memory instead of to a disk file. The Branch command lets you jump to any specified address, such as the entry point of the program just assembled into memory. And EDAS' reentrant nature lets you escape from test execution of your object code (by reset if necessary), and return to EDAS with your source intact (providing your testing hasn't run wild and squashed it).

One word of caution with regard to reentering EDAS. EDAS keeps its text pointers in low memory—starting at about 5300H. Therefore, going to DOS and using any of the library commands is likely to result in a confused EDAS after reentry. This will probably be corrected in EDAS' next release.

In the meantime, if you have used EDAS to assemble some code to memory and want to debug it, the best way to leave EDAS is to Branch to 30H. This puts you into the restart routine, which invokes De-

bug without issuing the DOS Debug library command. From Debug you can operate on your program in the usual fashion and finally jump back to EDAS with your test intact.

Upon entering EDAS, you are presented with a memory size question similar to that of Level II Basic. If you default by hitting Enter, EDAS uses the address pointed to by HIGH\$ (DOS' pointer to the highest available byte of memory) as its memory ceiling. If you answer the memory size question with a hex address, EDAS uses that address for its ceiling. This allows you to protect driver routines, monitors, and such in high memory. In either case, the text buffer and symbol table are cleared for a new session. Finally, if you answer the memory size question with zero, or by pressing Break, EDAS makes no restoration of its pointers. Thus, you may go on editing the same text you were working on before you last left EDAS, providing nothing has stepped on it in the meantime.

EDAS also supports lowercase. To avail yourself of this support, you must, of course, have a lowercase keyboard (no problem on a Model III) and lowercase driving software (again, no problem with the Model III). If necessary, EDAS' Memory Size feature can be used to protect the driver in high memory.

Once set up for lowercase, EDAS offers two modes of operation. In one, both upper and lowercase characters are maintained in the text buffer just as they were keyed in. This allows you to use EDAS' powerful editor to prepare word processing files.

In the other mode, certain lowercase letters are converted to uppercase as they are inserted, because assembler syntax requires instructions, mnemonics, and labels to all be uppercase. Even in this mode, EDAS does not convert material in quotes or comments, since lowercase in those areas would not generate assembly errors.

EDAS has several other improvements over what is available in editor/assembler. For example labels may be up to 14 characters long. E/A's limit is six letters. The extra letters are important to those us who would like to choose labels with a mnemonic quality or which contribute to the self-documenting nature of the program.

Another such improvement is EDAS treatment of DEFM, DEFB, and DEFW. Each of these now allows you to concatenate values.

Each value is separated from others in the value list by a comma. ASCII values

are surrounded by single quotes. For example

```
10 DEFM 'This is example',';#',1 assembles as 54H
68H 69H 73H 20H 69H 73H 20H 65H 78H 61H 6DH 70H
6CH 65H 20H 23H 20H 01H.
```

This string of hex characters, when looked at through ASCII-colored glasses, becomes: This is example # 1. (Note: the digit 1 in this example assembles as a hex 1, not an ASCII 1.) Items in the value list may also be expressions, for example: 20 DEFM 'T' + 20H, '=t' assembles as 74H 3DH 74H, which in ASCII is t = t.

Another nice thing about EDAS' handling of DEFM and DEFB is their compact presentation in the assembled listing.

One of EDAS' smallest, but most useful, advantages over E/A is its enabling of the clear key. I use this feature almost constantly, as I like to present myself with neat cohesive screenfuls of data when I'm programming. With E/A, I've had to hand scroll superfluous material off the screen by pressing the down-arrow 15 times in succession.

EDAS' documentation is well written and complete. Amazingly, it is printed on 70-pound lined paper, which makes merely turning the pages a luxurious experience. It does not contain an instruction-by-instruction explanation of the Z-80 opcodes. Those who need a course in Z-80 machine language will have to supplement the EDAS manual with additional material. The EDAS documentation quite correctly restricts itself to detailing the operation of the editor/assembler, and that it does quite well. There is a source file on the EDAS disk which has an un-commented list of all the Z-80 instructions.

"EDAS' documentation is well written and complete."

Finally, I would like to mention that a few minor bugs have been discovered in EDAS. They are cosmetic or documentary. None of them interfere with the basic functioning of the program. For instance, when explaining the Write command, the documentation indicates that a comma should be used to separate the

starting and ending line numbers. Actually, a colon (:) must be used. ■

Just as this article was about to be typeset, I learned that Misosys is ready to release EDAS 3.5. All registered EDAS owners will receive a notice to mail in a disk for a free upgrade. Here are the major improvements in the new version of EDAS.

There is now a cross-reference (X-REF) utility. It generates files containing every label declaration and reference. For each declaration, the value of the symbol is given. For each reference, the file name and line number of declaration are recorded. A source file of EQU's for all referenced symbols can be generated. The user can specify a page heading (and other page formatting specifications) for X-REF to use when printing its files.

A new utility, called Tape to Disk (TTD) has been added to the EDAS package. It converts EDTASM or EDTASM + source files from tape to disk.

Another new utility is CMDFILE, which allows the user to transfer object files from tape to disk and vice versa, merge object files, and perform similar manipulations.

*A number of improvements have been made to EDAS itself. It now accepts the additional logical operators: integer *, integer /, logical OR, and logical XOR. Four conditional operators for conditional assembly are now available.*

The following improvements have been made to provide compatibility with Microsoft's Macro-80 source files: A dollar-sign (\$) now may be the first character of a label. A label may be alone on a line. EDAS can now read and write Macro-80 source files with or without line numbers, and with or without Macro-80 headers.

A couple of new pseudo-ops are provided including COM, which forces a comment line to be written to a load module. (A comment line does not get copied into memory when the load module is loaded.)

EDAS 3.5 allows an object code filespec to be put into an assembly command line. and Gets a file that starts with a comment. Also, you now have a better chance of reentering EDAS from DOS with your source code intact, because the crucial vectors are being stored higher in memory. EDAS can now be run from a JCL (Job Control Language) file.

Certain prompts (like 'Mem Size' and 'End of Page') have been dispensed with. Users may specify the pertinent information when entering EDAS from DOS. Since this relies upon DOS' parameter scanning routine, the new version of EDAS is not compatible with NEWDOS-80. ■

EDUCATION 80

by Earl R. Savage

“Fortunately, these and similar procedures may be done in the computer’s memory.”

Last month we discussed ways of chaining programs so one can call up another. Examples of the “master menu” type of operation (where one program calls up any one of several programs) were given.

The same principle may be used to chain sequentially through a string of programs. As soon as a student finishes one program, the next is automatically called up.

The chaining technique can be effectively used in demonstrations and in instruction, where it is often advantageous to carry information from one program to the next or to accumulate data across a series of programs.

The First Chained Program

As an example, suppose the first chained program asks the student for his name. You would not want subsequent programs to ask for the same information; it is better to arrange for all of them to “know” the answer. Another use is to have each chained program store the student’s score so you can access his achievement on each one. This could be accomplished by printing the scores, but who has a printer connected to every computer?

Fortunately, these and similar procedures may be done in the computer’s memory (RAM). There must be extra memory—some memory at the top not required by any of the programs in the series, in which to store any information to be passed from program to program.

The first step is to reserve memory. Do this manually before loading the first program—answer the memory size question with the proper number. You will find, however, that there are several advantages to having the first program set the memory automatically. (If you have forgotten how to do this, review the procedure in the October Education 80.)

Once you have set aside memory you must make a special effort to store and retrieve data in that area. (A good thing, too; it prevents all but the most sophisticated student from changing it!) We’ll use POKE and PEEK to place and retrieve the data.

The statement examples which follow

were developed for a 48K Model III. Use on the Model I should require no changes. However, either machine with only 16K or 32K will require that the POKE, PEEK, and memory size addresses be changed accordingly.

```
10 POKE 16562, 255 : POKE 16561, 228
```

This first statement sets the memory size at 65510 just as though the question had been asked and answered with that number. Twenty-five RAM locations have been reserved for special use.

```
30 IF PEEK (-3) THEN 310
```

This example is taken from a master-

“... for the difference in cost... they will provide you with the Model III version.”

menu type program chain. If any value other than zero is found at -3 (65533), program execution transfers to line 310. Any time the menu program is run after the first run, the introductory material is skipped and the program goes straight to the menu.

There are times the locations above 16K must be referred to as negatives. Beyond the 16K boundary, PEEK and POKE require negative numbers which decrease to -1 at 65535 (see your TRS-80 manual for further details).

```
150 INPUT B$: REM FOR STUDENT NAME ENTRY
```

The name in B\$ will be lost as soon as another program is loaded. In order to keep it, we use the following technique:

```
160 Y = LEN (B$) - 1 : IF Y > 20 THEN Y = 20. This statement sets the value of Y equal to one less than the length of the student name. Because of the amount of RAM reserved, Y is limited to a maximum value of 20. 165 POKE -3, 1 sets location 65533 to the value of 1, to be read by line 30 the next time the menu is run. 168 POKE -4, Y POKES the length of the name (Y) into 65532.
```

```
170 FOR X = -26 TO -26 + Y : POKE X, ASC (MID$ (B$, X + 27, 1)) : NEXT
```

This line POKES the student’s name (one letter at a time) into reserved memory, beginning at 65510. Here is how it is retrieved:

```
310 Y = PEEK (-4)
315 FOR X = -26 TO -26 + Y : B$ = B$ + CHR$ (PEEK (X)) : NEXT
320 PRINT “HELLO, “B$”. IT’S GOOD TO SEE YOU BACK. HERE IS THE MENU AGAIN.”
```

Line 310 gets the name length from reserved memory. Line 315 concatenates the name letter by letter into the variable B\$. The student will be addressed by his name every time he returns to the menu to make another selection.

This technique can be used to pass any kind of information from one program to another. By putting line 315 in any subsequent programs, they will “know” the student’s name or whatever data you have stored.

If you wish to accumulate the student’s scores, have each program POKE its score in a different RAM location. You can use a special program to PEEK at the numbers and present them to you at any time.

When It Won’t Work

There are three circumstances which will prevent this technique from working. If any program in the chain POKES into the area where you are storing data, that data will be lost. If the student presses the Reset button, all will be lost. Finally, if the

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computer is turned off and then on, there will be no information stored. You can take steps to minimize the possibility of these things occurring.

To clear out stored data before another student uses the program chain, you can depend upon newly stored information which is POKEd in to replace the data from the previous student. Should you decide not to do so, you can turn the computer off, press Reset, or POKE in a string of zeros.

Passing values from one program to another has many advantageous uses in your CAI (Computer Assisted Instruction). It also opens up another dimension in your programming.

80 REMARKS

from page 6

tially. When we cut costs that generally means a few more pages of magazine for you.

We are seeing more and more articles on the use of word processors, and even hear them mentioned on television. It didn't hurt when Jimmy Carter (remember him?) turned to word processing for his writing. ■

Making Money

Ever since the microcomputer business began I've been asked for advice on which firms appear to be the best for investment. With the recent media attention to the industry my calls from people with venture money have been increasing.

I've been cautious about making any recommendations for several reasons. There have been some products which seemed to have good possibilities, but my confidence in the management of the firms was low. It is a sad fact of life that marketing and promotion go more to making a product a success than the value of the product itself. Indeed, we've watched some very good products go down the tubes as a result of mismanagement.

With the entry of IBM into the micro field there will be a new rash of business opportunities. Just as the Radio Shack system has generated an industry dependent upon it—as you can see from the 160 or so pages of ads in this magazine—so we will be seeing a similar phenomenon with the IBM (and the Xerox, and so on). Some of these peripheral firms are already into the tens of millions of dollars in

Word Processor Update

In an earlier column I mentioned Delmer Hinrichs' excellent word processor, listed in the June 1980 issue of *80 Microcomputing*. It was (and is) the best "freebie" word processor I have come across. It does a good job in preparing term papers, reports and the like. It has two major disadvantages.

A lot of time is required to key it into the computer the first time. (But, then, one hears that student labor is cheap!) Also, the response time is a bit slow because it is written in Basic. (One also hears that few teachers or students are such great typists anyway!)

sales, so this "support" type of business can be very profitable.

In recent weeks I've talked with a couple of small firms which have products or ideas which could, I think, quickly develop into massive money makers. Each need the money to get started with the promotion and production of their product.

Most of these firms need between a quarter and a half million dollars to really get going quickly. Each of three that I can think of are well established firms, but none have that amount of cash on hand for getting a new product out fast. The product sales should mushroom, when you consider the 300 percent yearly industry growth pattern which seems to be continuing and perhaps accelerating.

I'm going to look into the legal ramifications

"It didn't hurt when Jimmy Carter . . . turned to word processing for his writing."

tions of setting up an investment venture capital fund for getting needed products and services started with each share at \$1,000. The fund would own a share of the businesses and be on the board of directors, thus keeping an eye on the management of the firms. With some diversification, even if every investment didn't grow into a bonanza, it would be difficult to miss on all bets. At \$1,000 a share, I'll bet there are a lot of people who would like to get in on the action. I'll let you know if this looks feasible. ■

If you want to avoid all the typing and get a word processor that reacts faster, you might want to get in touch with Delmer (2116 S. E. 377th Avenue, Washougal, WA 98671). He has several improved versions available for tape or disk operation. Better yet, his prices are low. I would not imply that his word processors are equivalent to Scrispit or the Pencil, but for the price, they are terrific.

Delmer even has a word processor which will print a letter repeatedly, pausing to pick up a new name and address and use the first name in the text wherever you wish. Could be very handy when you are writing original letters to parents or students.

Upgrading from Model I to III

There is no question that Radio Shack is selling a lot of Model III machines. As time goes by, more and more schools will be replacing their Model I machines. When we upgrade from a Model I to a Model III, we have a different situation from those of you who start off with a Model III.

Model I users have accumulated a variety of utility programs. Some may not be needed after upgrading, because their functions are built into the Model III. Most, however, would continue to fill a need if they would work on the Model III.

Since I upgraded, I have found some of my old utilities work well; others function only partially and still others, not at all. Replacing a lot of utilities can be impossible after the school or activity budget has been broken in the upgrading process!

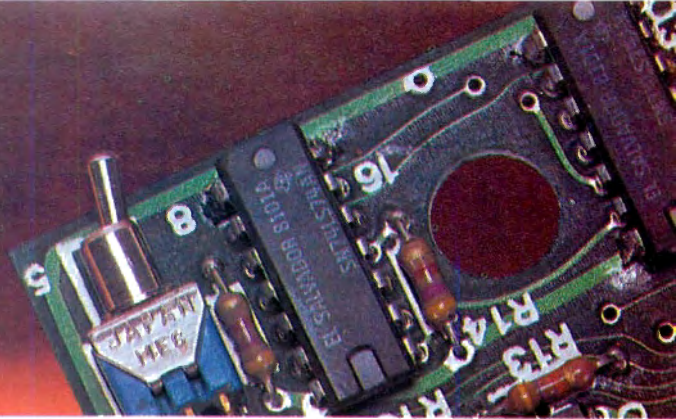
Fortunately, some producers of utilities are very cooperative in these circumstances. The general policy seems to be that for the difference in cost between the two versions, they will provide you with the Model III version.

To date, I have found two producers to be quite helpful. One of these is Cottage Software (if you aren't using Packer, you must not be writing programs). The other is Computer Applications Unlimited.

This is not to say that the other manufacturers are uncooperative in solving this problem; I have written to some others and have not yet given up on receiving a reply.

To help each other through the exchange of information, let me know your experience with utilities in the upgrading process. Which have you found that work just as well on the Model III? Which won't? What reactions have you gotten from the producers? Be sure to give me your Model I set-up and the new Model III configuration, as well as the names of the utility and the producer. ■

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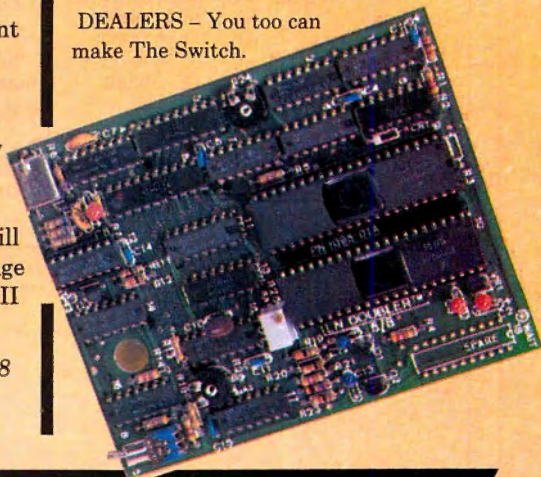
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THE ASSEMBLY LINE

by William Barden, Jr.

"When we last left our wimpy hero, the Color Computer, he... was trying to pass an argument..."

Last month we covered some preliminary ground on the use of machine language subroutines in the Color Computer. This month we'll complete the course and send you your gold-embossed Certificate of Completion for 6809 machine language programming.

When we last left our somewhat wimpy hero, the Color Computer, he had successfully run some machine language programs and was trying to pass an argument to the machine language subroutine. As we tune in this month, we confront the floating-point accumulators.

There are two floating-point accumulators in page 0 of RAM (locations 0 through 255). They are designated FAC 1 (locations 79 through 84) and FAC 2 (locations 92 through 97). Each of these is six bytes long. They hold floating-point numbers, numbers that represent a form of "scientific notation." Let's review what we know about scientific notation...

Scientific Notation

Scientific notation uses a mixed number and power of ten to represent any size number. A somewhat standard form for Basic is shown by this example: 1.2E + 10.

```

STA $2000 B7 2000 183,32,0
STX $2001 BF 2001 191,32,1
LDB #6 C6 06 198,6
LDY #2003 108E 2003 16,142,32,3
LOOP LDA ,X+ A6 80 166,128
STA ,Y+ A7 A0 167,160
DECB 5A 90
BNE LOOP 26 F9 38,249
RTS 39 57
    
```

Program Listing 1. Store A/C/FAC

```

100 DATA 183,32,0,191,32,1,198,6,16,142,32,3,166,128,167,160,90,38,249,57
105 DEFUSR0=&H2009
110 FOR I=&H2009 TO &H201C
120 READ A
130 POKE I,A
140 NEXT I
145 INPUT X
150 A=USR0(X)
160 FOR I=&H2000 TO &H200B
170 PRINT PEEK(I);
180 NEXT I
190 PRINT
200 GOTO 145
    
```

Program Listing 2. Basic Program to Display FAC

A 10 is taken to the 10th power, or 100,000,000,000, and multiplied by 1.2. The actual number represented is 120,000,000,000. Negative numbers can also be represented, as in 5.333E-5, which is $1/1,000,000 \times 5.333$ or .00000533.

To convert any number to scientific notation form, move the decimal point to the right of the first significant digit and count the number of places. The count becomes the power of ten, either positive (original number greater than one) or negative (original number less than one). The following are examples:

12345 = 1234.5E + 1 = 123.45E + 2 = 12.345E + 3 = 1.2345E + 4
 .0000234 = 0.000234E - 1 = 0.00234E - 2 = 0.0234E - 3 = 0.234E - 4 = 2.34E - 5

The advantage of scientific notation is that arithmetic operations can easily be carried out on a range of numbers.

Basic uses a modified form of scientific notation internally for floating-point numbers. In place of powers of 10, powers of 2 are used. In place of a mixed number, a fraction is used for the mantissa. To see the form used, we'll use still another machine language program with a Basic driver.

Program Listing 1 shows the machine language program. Let's go through the instructions step by step: The first two instructions store A and X as before, into \$2000 and \$2001, \$2002. The next instruction loads the B register with six. B is used as a loop counter for six passes through the loop.

The next instruction loads the Y register with a value of \$2003. This value points to the \$2003 area. The LDA instruction loads

```

ARGUMENT= 0
0 0 79 0 128 0 0 0 0
ARGUMENT= 1
0 0 79 129 128 0 0 0 0
ARGUMENT= 2
0 0 79 130 128 0 0 0 0
ARGUMENT= 3
0 0 79 130 192 0 0 0 64
ARGUMENT= 4
0 0 79 131 128 0 0 0 0
ARGUMENT= 7
0 0 79 131 224 0 0 0 96
ARGUMENT= 10
0 0 79 132 160 0 0 0 32
ARGUMENT= 100
0 0 79 135 200 0 0 0 72
ARGUMENT= 1000
0 0 79 138 250 0 0 0 122
ARGUMENT= 10000
0 0 79 142 156 64 0 0 28
ARGUMENT= 100000
0 0 79 145 195 80 0 0 67
ARGUMENT= 1000000
0 0 79 148 244 36 0 0 116
    
```

Fig. 1. FAC Values

```

ARGUMENT=-1
0 0 79 129 128 0 0 0 128
ARGUMENT=-2
0 0 79 130 128 0 0 0 128
ARGUMENT=-3
0 0 79 130 192 0 0 0 192
ARGUMENT=-15
0 0 79 132 240 0 0 0 240
    
```

Fig. 2. Negative FAC Values

the memory location pointed to by the X register. Since we entered the subroutine with X pointing to the FAC area, the first byte of the FAC (79) will be loaded into A. The plus sign means that the X register is incremented by one to point to 80. The STA stores the A register contents into the location pointed to by the Y register. Since we just loaded Y with \$2003, the contents of 79 will be transferred to \$2003. The Y register is then incremented by one by the plus sign.

Next, the count in B is decremented by one to five. If the count is not equal to zero, the loop is again executed. Each time through the loop, one more byte will be transferred from the FAC area to the \$2003 area, until all six bytes are transferred. (We used six bytes on blind faith from the Extended Color Basic manual.)

The Basic driver is shown in Program Listing 2. This program transfers the decimal data form of the machine language code to the \$2009 through \$201C area. (The \$2000 through \$2008 area is

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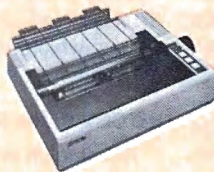


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reserved for A, X and the six bytes of FAC.) Next, the input X command is executed so we can use various values in the USR0 call.

After the USR0 call is made with X as the input argument, the area from \$2000 through \$2008 is printed. Typical values are shown in Fig. 1.

The first value represents the contents of A coming into the machine language program. It is always zero, indicating a numeric (rather than string) value. The next two values are the pointer in X coming into the machine language program. X always points to location 79, the FAC.

The next six bytes represent the number in floating-point format. The first byte of this is the power of two plus 128. What? The 128 bias is used to simplify arithmetic operations on the floating-point number, and additionally, to cloud programmers' minds. Look at an input argument of one. The exponent value is 129. A value of $129 - 128 = 1$, so the power of two represented is one.

The next four bytes are the fraction. An input value of three, for example, has 192 or 11000000 for the first byte, followed by zeroes. The fraction is therefore .110000000000000000000000. (The fractional powers of two are $1/2, 1/4, 1/8, \dots$). The floating-point form of three is therefore $130 - 128 = 2^2 \times .11 = 3$. The floating-point form of 100 is $135 - 128 = 2^7 \times .11001000 = 1100100 = 100$.

The last of the six values is the sign of the fraction. A value less than 128 is a positive sign, while a value greater than 127 is a negative sign. (This byte is a signed eight-bit value representing -128 through $+127$ in two's complement form.) Fig. 2 shows representative negative values for the FAC.

That is the format of numbers held in the floating-point accumulator. This does not mean we must work with floating-point numbers in the machine language subroutines. As a matter of fact, most processing will *not* be using floating-point numbers, but simple integer numbers that can be held in 16 bits. Why then the inter-

face to floating-point numbers—Only God, Radio Shack, and Microsoft know the reason. This USR call is similar to the Model II, which also uses a pointer to a floating-point number. The Models I and III, however, pass only 16-bit integer values, which, to my mind, is much more convenient.

INTCNV to the Rescue

Reading on in the Extended Color Basic manual, we find it's possible to call a ROM subroutine named INTCNV, which will convert the argument to a 16-bit value. The code in Fig. 3 shows this. JSR \$B3ED calls INTCNV with X pointing to the FAC. The INTCNV subroutine converts the floating-point value in the FAC area to a 16-bit integer value and puts it in the D register (the A and B registers taken together). The STA stores A and the STB stores B into locations \$2000 and \$2001, respectively.

Program Listing 3 is the Basic driver for these four instructions. The equivalent data values are first POKEd into locations \$2003 through \$200C. The argument is then input, and a USR0 call is made. After the call, locations \$2000 (A) and \$2001 (B) are printed. Fig. 4 shows the A and B values after the INTCNV conversion. They represent the values in the USR0 call. The numbers are signed 16-bit values, in which the most significant bit is the sign (1 = negative, 0 = positive).

The two bytes make up 16 bits. To find the equivalent binary value, write the first value in eight bits, immediately followed by the next value in eight bits. 117, 48, for example, becomes 01110101 00110000. If the sign bit is zero, the number is correct as it stands $-117,48$ represents \$7530, or 30,000. If the sign bit is one, change all the ones to zeroes, all the zeroes to ones, and add one to get the negative value represented (138,208 becomes 10001010 11010000, with the sign bit = 1). "Complementing" produces 01110101 00101111, and adding 1 gives a final result of 01110101 00110000, or 30,000, negated.

INTCNV is one way to pass an integer value to the machine language subrou-

JSR	\$B3ED	BD	B3ED	189,179,237
STA	\$2000	B7	2000	183,32,0
STB	\$2001	F7	2001	247,32,1
RTS		39		57

Fig. 3. INTCNV Example

ARGUMENT=	0
0	0
ARGUMENT=	1
0	1
ARGUMENT=	5
0	5
ARGUMENT=	30000
117	48
ARGUMENT=	32767
127	255
ARGUMENT=-	1
-255	255
ARGUMENT=-	2
255	254
ARGUMENT=-	-30000
138	208
ARGUMENT=-	-32768
128	0

Fig. 4. A + B Values after the INTCNV Conversion

tine, albeit a somewhat roundabout way. Another way would be simply to POKe an eight-bit or 16-bit value into dedicated memory locations and then have the machine language code pick up the value directly. This would work well for multiple arguments. Make certain the dedicated location is in the protected area of RAM and does not overlay the program area.

Passing String Arguments

How about the case in which the argument passed by the USRn call is non-numeric? A non-zero value in A indicates a string argument will be passed. In this case, X will not point to the FAC area, but will point to a string parameter block.

The string parameter block is shown in Fig. 5. It is made up of five bytes. Byte 0 is the length of the string, up to 255 bytes. Byte 1 is reserved. Bytes 2 and 3 contain the address of the string. This may be in a Basic statement for strings, such as: 100 A\$="SUCH STRINGS AS..." or the address may point to the string storage area at top of (non-protected) RAM. Byte 4 is reserved.

This column is loaded with programs,

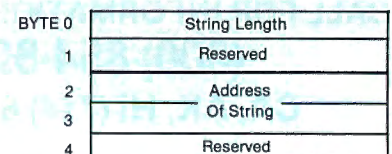


Fig. 5. String Parameter Block

```

100 DATA 189,179,237,183,32,0,247,32,1,57
105 DEFUSR0=&H2003
110 FOR I=&H2003 TO &H200C
120 READ A
130 POKE I,A
140 NEXT I
145 INPUT X
150 A=USR0(X)
155 PRINT#-2,"ARGUMENT=";X
160 FOR I=&H2000 TO &H2001
170 PRINT#-2,PEEK(I)
180 NEXT I
190 PRINT#-2
200 GOTO 145
    
```

Program Listing 3.

STA	\$2000	B7	2000	183,32,0
STX	\$2001	BF	2001	191,32,1
LDB	#5	C6	05	198,5
LDY	#2003	108E	2003	16,142,32,3
LOOP LDA	,X+	A6	80	166,128
STA	,Y+	A7	A0	167,160
DECB		5A		90
BNE	LOOP	26	F9	38,249
RTS		39		57

Program Listing 4.

but I suspect you (and I) need all the 6809 programs we can get. Program Listing 4 shows another machine language program built along the lines of preceding ones. It stores A in \$2000, X in \$2001, \$2002 and the string parameter block in \$2003 through \$2007.

The Basic driver for this machine language wonder is shown in Program Listing 5. As before, the data values representing the machine language code is transferred to \$2008 through \$201B. A test string of \$A is entered and passed to the program via the USR0 call. The output argument B\$ is a dummy string rather than a numeric variable.

After the USR0 call the string starting address SA is picked up from the parameter block copy at \$2005, \$2006. The value of A, X, and the parameter block is printed. SA is used to print the length of the string by a series of PEEKs, shown in Fig. 6. The first entry of Fig. 6 shows an A value of 255 (string variable), an X value of 31,149 (8085 = string parameter block location), and the five bytes of the string parameter block, length 22, string location 63, 129 or 16257.

The same scheme as above can be followed to find the location of Basic text strings. This is a handy feature if the machine language subroutine is searching or sorting strings, or if the strings are dummy strings containing data other than text, such as multiple arguments to be passed to the machine language processing.

Using VARPTR

We now come to a confusing paragraph in the six pages on the use of VARPTR. VARPTR in the other TRS-80s will point to a variable, string parameter block, or the first element of an array. For example:

```
100 B = VARPTR(AA)
110 C = VARPTR(ZX(0))
120 D = VARPTR(SS)
```

will set B equal to the location of variable AA, C equal to the location of the first element of array ZX, and D equal to the location of the string parameter block of string SS.

As it turns out, that is exactly the way VARPTR works in the Color Computer.

```
255 31 149 22 0 63 233 0
STRING ADDRESS= 16361
STRING=TANDY TOWERS OVER ALL!

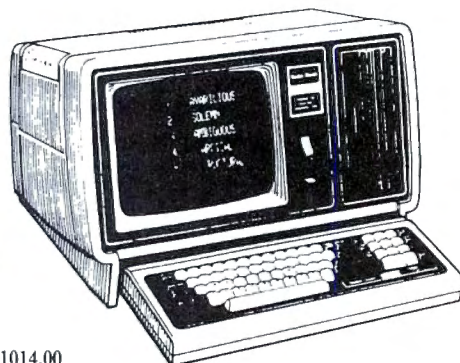
255 31 149 30 0 63 181 0
STRING ADDRESS= 16309
STRING=HAVE YOU HUGGED YOUR CC TODAY?
```

Fig. 6. String Parameter Block Format

```
100 DATA 163,32,0,191,32,1,198,5,16,142,32,3,166,128,167,160,90,38,249,57
110 DEFUSR0=&H2008
120 FOR I=&H2008 TO &H201B
130 READ A
140 POKE I,A
150 NEXT I
160 INPUT A$
170 B$=USR0(A$)
180 SA=PEEK(&H2005)*256+PEEK(&H2006)
190 FOR I=&H2008 TO &H2007
200 PRINT PEEK(I);
210 NEXT I
220 PRINT
230 PRINT "STRING ADDRESS=";SA
240 PRINT "STRING=";
250 FOR I=1 TO PEEK(&H2003)
260 PRINT CHR$(PEEK(SA+I-1));
270 NEXT I
280 PRINT-PRINT
290 GOTO 160
```

Program Listing 5. Basic Driver for String Analyzer

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```

STA $2000 B7 2000 183,32,0
STX $2001 BF 2001 191,32,1
JSR $B3ED BD B3ED 189,179,237
TFR D,X 1F 01 31,1
STX $2003 BF 2003 191,32,3
LDB #5 C6 05 198,5
LDY #$2005 108E 2005 16,142,32,5
LOOP LDA ,X+ A6 80 166,128
STA ,Y+ A7 A0 167,160
DECB 5A 90
BNE LOOP 26 F9 38,249
RTS 39 57
    
```

Program Listing 6. Store A/C/FAC

The output of VARPTR is a pointer to the variable. The Extended Color manual states "X = USR0(VARPTR(A)) passes a pointer to the variable A." It isn't quite as easy as picking up the pointer in X on entry to the machine language subroutine thinking it will point to the variable.

For a USRn call with a numeric call, the X register always points to the FAC area at location 79. That's true even if VARPTR is used, as in: 100 X = USR0(VARPTR(A)).

The pointer is converted from a 16-bit integer value into a floating-point number in the FAC area. If VARPTR(A) is 7988, indicating that variable A is located at location 7988, the 7988 will be converted into floating-point format and put into the FAC at 79. To find the VARPTR location we must use INTCNV to convert the FAC value to an integer value. After we do this, the D register (A and B) will hold the address of the variable.

Sure enough, we have another machine language program to show you how this works. Program Listing 6 stores A into \$2000 and X into \$2001,\$2002 upon entry to the machine language subroutine. INTCNV is called at \$B3ED to convert the FACX value to integer. The integer value in D is transferred to X and stored in \$2003, \$2004. B is then loaded with a loop count of five and Y with a pointer to \$2005.

The loop is executed five times. Each time through the loop, the byte pointed to by X is stored into \$2005 through \$2009, transferring the five-byte variable into the \$2005 area. At the end of the subroutine, we have stored data as shown in Fig. 7.

The Basic driver for this program is shown in Program Listing 7. As usual, the data making up the program is first transferred to \$200A through \$2025. Next, variable B is input. The machine language subroutine is called by USR0(VARPTR(B)). The data in \$2000 through \$2009 is then printed.

When the above program is run with sample values (Fig. 7) for B, we find some interesting results. A is always zero, indi-

```

100 DATA 183,32,0,191,32,1,189,179,237,31,1,191,32,3,198,5,16,142,32,5,166,128
110 DATA 167,160,90,38,249,57
120 DEFUSR0=&H200A
130 FOR I=&H200A TO &H2025
140 READ A
150 POKE I,A
160 NEXT I
170 INPUT B
180 A=USR0(VARPTR(B))
190 FOR I=&H2000 TO &H2009
200 PRINT PEEK(I);
210 NEXT I
220 PRINT:PRINT
230 GOTO 170
    
```

Program Listing 7. Driver for VARPTR Analysis

ating a numeric variable. X always points to location 79 on entry to the machine language subroutine. The next two values are the location of B in RAM. The two bytes of 31,52 are 00011111 00110100, or 7988, the location of variable B. The next five bytes are the floating-point representation of the variable. As the manual states, "floating-point variables are stored in the variable table in a slightly different format than they are stored in the FAC."

The format here is very similar to the FAC format. There are five bytes rather than six; the last byte represented the sign in the FAC format. The sign, however, can be represented in one bit! The sign bit becomes the first bit in the mantissa, replacing the first mantissa bit. Since this first bit is always a one, we haven't lost any information! But why is the first bit always a one?

Every floating-point number in the variable table is "normalized." Normalization simply means adjusting the number until the first fractional bit is one, similar to our scientific notation normalization; this is done by shifting right or left, with each shift adding or subtracting one to the exponent. The format of variables, therefore, has all the precision of the FAC, but is a little harder to read.

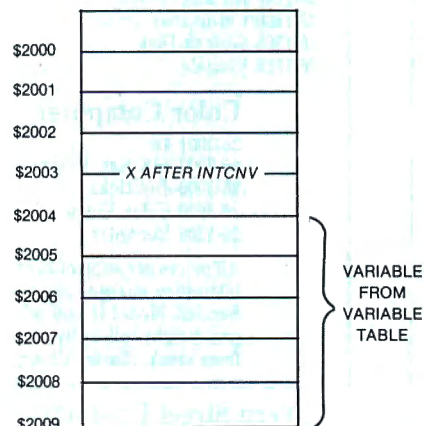


Fig. 7. Store Variable Program Storage

Consider the value of B = 100, in Fig. 8. The exponent is 135. When the bias of 128 is subtracted, the power of two is seven. The fractional part is 72, or 01001000 000...00. The sign bit is the first fractional bit, or zero (positive). When the one bit that should be there is added, the fraction becomes 11001000, or 1/2 + 1/4 + 1/32, or 200/256. Two to the seventh is 128 and 128 x 200/256 is 100.

Negative values must be two's complemented as in previous examples.

When VARPTR is used with string variables, the pointer in X is to a string parameter block as previously discussed.

Passing Arguments

The last page and a half of the six pages discuss passing arguments back from the machine language subroutine. The Basic interpreter assumes that the FAC area will hold the argument passed back.

```

100 A = USR0(1000)
110 PRINT A
    
```

In the above example, A will be set equal

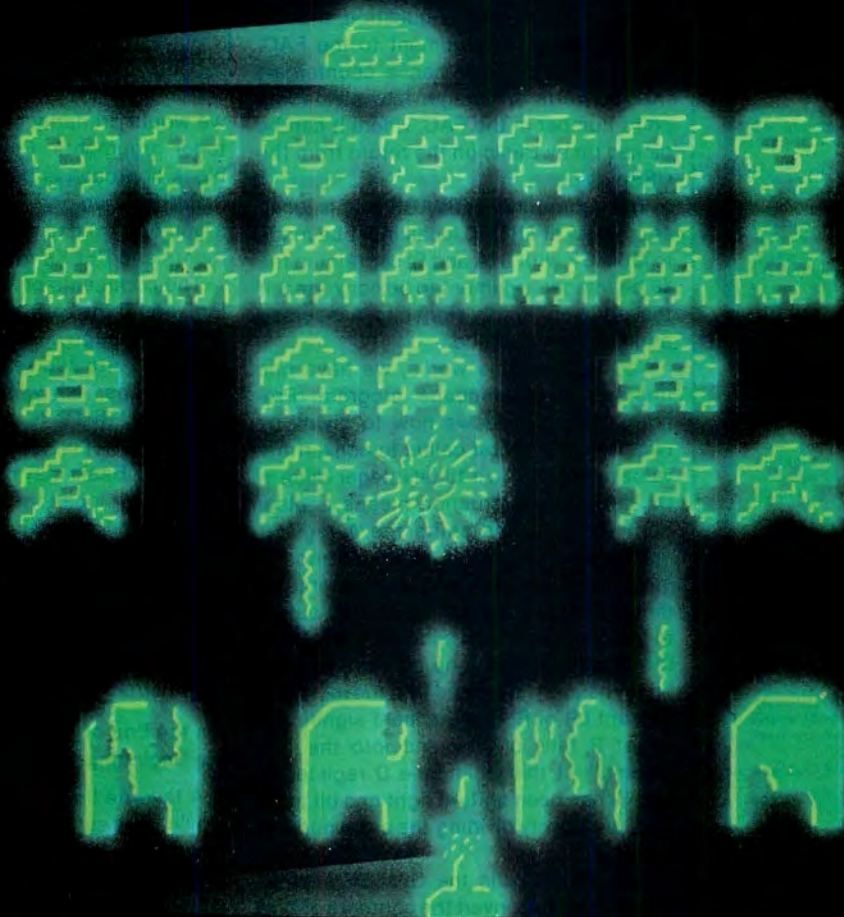
B= 0	0 0 79 31 52 0 0 0 0 0
B= 1	0 0 79 31 52 129 0 0 0 0
B= 2	0 0 79 31 52 130 0 0 0 0
B= 3	0 0 79 31 52 130 64 0 0 0
B= 100	0 0 79 31 52 135 72 0 0 0
B=-1	0 0 79 31 52 129 128 0 0 0
B=-2	0 0 79 31 52 130 128 0 0 0
B=-3	0 0 79 31 52 130 192 0 0 0
B=-100	0 0 79 31 52 135 200 0 0 0

Program Listing 8. Divide by Two Program

Even if you have one of the other versions on the market, you'll still consider this program a **MUST** for your collection.

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to 1000, as the Basic interpreter picks up 1000 from the FAC.

As I mentioned previously you will probably not be working with floating-point numbers in your machine language programs. You will typically be picking up eight and 16-bit integer arguments, processing them, and returning eight or 16-bit integer arguments. The question, then, is how to return an argument to the FAC. Fortunately, INTCNV has a counterpart that converts an integer into a floating-point number in the FAC, where it can be picked up by Basic on the return from the USRn call.

The subroutine is GIVABF, and is located in ROM at \$B4F4. A call must be made to GIVABF with D (A and B) containing the 16-bit integer argument to be converted. If the argument is only eight bits, A is zeroed and B holds the value.

To see how this works, we have one final machine language program. Program Listing 8 shows how to divide by two. INTCNV is first called to convert the value in the FAC to a 16-bit integer value in D. The LSRA instruction means Logical Shift Right A, and shifts the A register right one bit position. A zero goes into the most significant bit, and the contents of the least significant bit are shifted out into the carry condition code. RORB rotates the B register right one bit position. The bit in the carry is rotated into the most significant bit of B, and the least significant bit of B falls off the end into the "bit bucket." At this point, the D register (A and B) has been shifted right one bit position, effectively dividing the entry number by two.

JSR \$B4F4 calls the GIVABF subroutine in ROM to convert the contents of D to a floating-point number in FAC. The RTS then returns. Program Listing 9 is the Basic driver for this program. It simply transfers the data values as before, asks for input, calls the machine language subroutine, and prints the output value.

Passing Back Multiple Arguments

The six pages finish with "passing back multiple arguments" and cautions about the use of string variables on output. I don't know how practical it would be to pass back modified variables, as again,

JSR	\$B3ED	BD	B3ED	189,179,237
LSRA			44	68
RORB			56	86
JSR	\$B4F4	BD	B4F4	189,180,244
RTS			39	57

Program Listing 8. Divide by Two Program

```
100 DATA 189,179,237,68,86,189,180,244,57
110 FOR I=8H2000 TO 8H2008
120 READ A
130 POKE I,A
140 NEXT I
150 DEFUSR0=8H2000
160 INPUT A
170 B=USR0(A)
180 PRINT B
190 GOTO 160
```

Program Listing 9. Basic Driver for Divide by Two Program

we would primarily be concerned with integer arguments. Probably the reserved block approach is best here—dedicate a block of memory for input and output arguments, and use POKEs for input arguments and PEEKs for output arguments.

The comments on string use are excellent, and if the cautions are followed, machine language code can process strings nicely in sorts and searches. Bear in mind that strings, like variables, move! Make certain VARPTR is used directly in the USRn call; if it is not, a garbage collection routine in Basic may have shuffled around the string locations. Also be wary of changing strings within Basic programs. Basic lines terminate on a zero, and returning a zero value in a dummy string may wreak havoc upon return from the USRn call. In general, I wouldn't recommend using strings for passing output arguments.

It's the End of Him, But Just the Beginning for Us...

A favorite line from a Grade C monster movie... Yes, "Assembly-Line" readers, this is my last column. I've enjoyed writing very much, and sincerely appreciate the many letters I've received (except for the one from Manny, who sent me a 250-page listing with a demand to "straighten out his eight-dimensional string sort"). You'll see me again in some other articles—there's a lot of exciting things happening and I intend to keep writing. Keep on assembling... ■

The editors of 80 Microcomputing regretfully say goodbye to Bill Barden as author of "The Assembly Line." The Assembly Line will be kept rolling in a new column that will begin next month, to be written by Roger Fuller (Supermap author). To keep our advanced Assembly programmers happy, we are planning a new column, to begin in January, which will be written by a variety of programmers.

And we don't plan to let Bill go without a struggle. We have him on line for a feature article on Color Graphics, which will run in our March Color Graphics issue.

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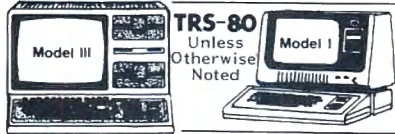
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By Steven Kearns from Acorn Gigantic antimatter rocks appear on the Tactical Display Screen of your spacecraft. You blast away with lasers and they just explode into smaller chunks. To score in this fast arcade game with sound, you must destroy the rocks. To stay in the game at all, you must avoid them!

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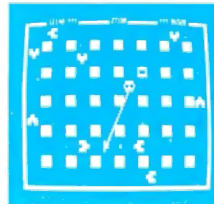
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METEOR MISSION 2

By Hogue & Konyu from Big Five Six astronauts are stranded on a desolate planet. You must undock from your command module and maneuver your rescue shuttle through the asteroid field to save them. You can only save one at a time, and each landing burns away parts of your landing sites. Order this realtime action game now or live with the astronauts' pitiful screams forever.

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ATTACK FORCE!

By Hogue & Konyu from Big Five Unlike the usual "shoot-em-ups," Attack Force lets you control both speed and direction as you maneuver all over the screen in search of the alien Ramships and Flagships. Enemy ships chase you everywhere, and the Flagships' lasers can fire in any direction! The Ramships can even impersonate your spacecraft, so don't look away even for an instant. Machine language action with sound.

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ACCEL 2 BASIC COMPILER

From Allen Gelder

Turns your BASIC program into a machine
 language/BASIC hybrid that may run many
 times faster. For those who plan to sell their
 programs, compiling by ACCEL 2 offers the
 additional advantage of protection: the source
 code and REMarks are not included in the
 compiled version.

While all compilers may require some modifica-
 tion of the BASIC program (usually because
 of improper structuring), we have found that
 ACCEL 2 requires the least, and even works
 with program "tricks" like string-packing,
 etc.

ACCEL 2 works with models I or III, requires
 a minimum amount of memory, supports either
 disk or tape (with TSAVE, optional at \$9.95),
 and does not require extensive rewriting of
 your BASIC programs. Unlike other com-
 pilers, no royalty is required when selling
 ACCEL-compiled programs.

Supplied on tape for 16-48K...\$88.95

PACKER

From Cottage Software

Packer's five commands allow tremendous con-
 trol over the readability and efficiency of
 your BASIC programs. Specify "PACK" and
 the program will compress text into multiple
 statement lines. This really speeds up stor-
 age, load, and execution time. PACKER is al-
 so useful in compressing code to be compiled
 by ACCEL 2 (above).

Also included are four other handy utilities:
 "MOVE" lets you relocate program lines, "RE-
 NUMB" allows program renumbering,
 "SHORT" deletes unnecessary words and
 REMarks, and "UNPACK" separates multi-
 statement lines to ease editing.

16K, 32K & 48K tape...\$29.95

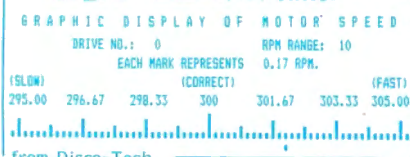
BOSS

By V. Hester from Soft Sector

This utility is the perfect tool for creating
 and debugging BASIC programs. It allows
 single stepping through the Basic program,
 setting up to five breakpoints within the pro-
 gram and tracing of program logic using only
 a small portion of the display screen. With
 BOSS, you can review selected variables
 during program execution and return to the
 program with the display restored. Allows
 storing programs in high memory for later re-
 trieval. For Level II, TRSDOS, NEWDOS+,
 NEWDOS/80, VTOS.

Model I or III (specify) tape: \$18.95

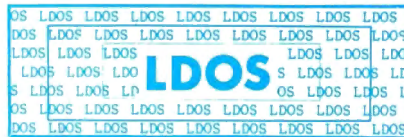
DDT Disk Drive Timer



from Disco-Tech

Analyze and adjust your disk drive motor
 speed with a realtime graphic display. Manual
 details use for virtually all popular drive
 units. Avoid the many errors that improper
 drive timing can cause. All you need is DDT,
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From Lobo

"...LDOS is by far the best disk operating
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Paul Wiener,
 June 80-MICROCOMPUTING

"...if you are a serious programmer, you
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George Blank, Editorial Director
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Completely device independent, LDOS pro-
 vides for routing, linking, setting, and filter-
 ing of the input/output of a number of
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 hard disks.

"Job Control" can end the tedium of repetitive
 keystrokes needed to call up and manipulate
 programs. Once you tell LDOS what it needs to
 do to get you up and running, it executes the
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 LDOS notes the date all files were created or
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 been backed-up after modification.

We've just scratched the surface of LDOS'
 capabilities, and we'll gladly send you a
 pamphlet that goes into more detail. But
 better yet, order LDOS now and begin
 enjoying the power that this system will bring
 to your computer use.

Disk with manual: \$169.95
 Specify model I or III

BASIC Programming Asst. ✓ 156

From Instant Software

What an aide to the writing and debugging of
 BASIC programs! With BPA you can list out
 your program variables, with a notation of
 variable type, whether each is an array or
 not, and a notation of line numbers where the
 variable occurs. What's more, BPA even tells
 you the line numbers where any variable
 changes value! You can also produce a cross-
 reference to all GOTOS, GOSUBS, and
 IF...THEN statements for easy visualization of
 program flow. Want to find that last INPUT
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 where selected BASIC keywords reside. Save
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Just Released

ASYLUM

From Med Systems

You are sitting alone at 2 AM. Your eyes are bloodshot as you peer into your computer's screen and cry, "I must be CRAZY!" If this has never happened to you, you've never tried ASYLUM. It's Med Systems most ambitious 3-D graphics adventure yet!

ASYLUM places you on a cot in a small (padded?) room. Periodically the janitor lobbs a hand-grenade through the window. What you do next could mean escape -- or disaster.

16K tape...\$14.95

DEATH-MAZE

5000



From Med Systems

A new breed of adventuring! Venture through a graphically represented 3-D maze, with halls that could dead end -- or recede to infinity. Step through the doors or drop into the pits. Will you encounter monsters and mayhem, or will you be treated to useful objects and information? Will you ever get out alive?

16K tape...\$14.95 32K disk...\$19.95



From Med Systems

A nightmare of an adventure in graphically depicted three dimensions. Corridors stretch toward infinity right on your TRS-80 screen as you search this maze for treasures. If you get the feeling you're not alone, it's because you're not!

You use the arrow keys, plus two-word commands to move, manipulate objects and avoid the many pitfalls (pun intended) that await you in Labyrinth.

16K Tape...\$14.95

MICROWORLD

From Med Systems

One of the strangest adventures yet, with wierd-sounding rooms and baffling tools n' treasures -- it all takes place inside your TRS-80! You're in the keyboard, exploring the inner structure. Go from chip to chip as if you were a piece of data trying to get from one end of the bus to the other. Fascinating and instructive.

16K tape...\$19.95 16K disk...\$24.95

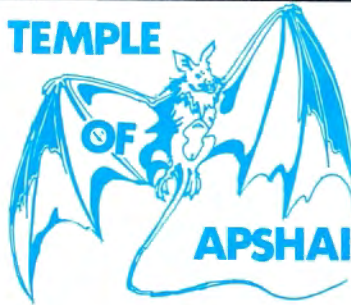
FORBIDDEN PLANET I

By Wm. Demas from Fantastic Software

The first TALKING adventure! With skill, luck, and tenacity -- and a little help from your chatty TRS-80 -- you may survive Part One of this multipart adventure! You don't need a voice synthesizer, this program talks to you via the cassette port. And it's a good thing it does, 'cause otherwise you'd get mighty lonesome on desolate FORBIDDEN PLANET.

48K disk...\$39.95

TEMPLE OF APSHAI



TEMPLE OF APSHAI

The first of the DunjonQuest series, and still one of the most popular. In exploring over 200 rooms in the magical labyrinth, you will encounter more than 30 kinds of fearsome monsters guarding over 70 treasures. Some of the treasures will help you in your quest, but you must still watch out for the many monsters and traps that spring out from the walls and shadows.

16K tape or 32K disk...\$39.95

LOWER REACHES OF APSHAI: Four more levels. Requires above program. \$19.95

HELLFIRE WARRIOR

Sequel to APSHAI, this thriller gives you four levels to explore with sixty rooms each. New monsters, new traps, new challenge!

16K tape or 32K disk...\$39.95

KEYS OF ACHEREON: Four more levels. Requires above program. \$19.95



By Godwin & Knowlton from Acorn

Not for everyone. One reviewer said, "...don't bother with Everest Explorer." Another commented, "It holds your attention for quite a while and I have yet to get bored with it."

Most people here love it. This is a game of logistics in which you try to lead a team up Mount Everest. If your skill, the weather, and luck hold out, you'll make it. But remember, you'll also have to get back down safely.

16K protected tape...\$19.95

32K protected disk (with "save game" feature)...\$19.95

LOST COLONY

By David Feitelberg from Acorn

The scene is the world's first attempt at colonizing a planet in deep space. An election was held for an economic manager to straighten things out, and guess who won!

You must either make things better or be voted out of office in shame. A remarkable simulation, LOST COLONY arms you with maps and charts as tools for resource management. You assign human and robotic labor forces, explore new land, and allocate production quotas. Input to the computer is free form: you can use terse commands or full sentences. A challenging game, LOST COLONY might give you insight into real life management as well.

16K protected tape...\$19.95

32K protected disk...\$19.95

Prices Subject to Change

Special MICROSOFT Save \$10 ADVENTURE

Prepare yourself for the adventure of your life as this classic fantasy/logic game takes you into the world of the Colossal Cave. Your computer is your guide as you search for treasures, solve puzzles, explore, and avoid the dangers that lurk within.

Complete version of the original Adventure, originally written for the DEC PDP-10 in FORTRAN. The program has been translated to bring you all the enjoyment in your home computer.

Model I, 32K disk...\$29.95

SPECIAL SAVE \$10: \$19.95 thru 12/31!

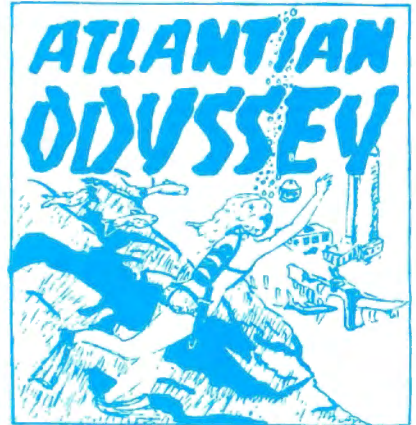
ZORK



By Infocom from Personal Software

In Zork, the Great Underground Empire, unearthly creatures guard 20 treasures. Bring all the treasures back to the trophy case and you can leave alive! You must pick your way through intricate mazes, collecting objects that may help or hinder you in your quest. You may use standard 2-word responses or speed things up by using multipart statements. But keep your wits about you, because in Zork, they take no prisoners!

Model I, 32K disk...\$39.95



From Interpro

An illustrated adventure for the TRS-80. It's said that "a picture is worth a thousand words," and in this program you'll see why. While still in the classic text-type mold, the graphics give you a new perspective and aid your sense of direction. This saga of the sea contains a 150 word vocabulary and depicts 32 graphic locations.

Model I 48K disk...\$29.95

16K tape (Text only, No graphics)...\$14.95

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NEW VOYAGE TO VALKYRE

By Leo Christopherson from AOS
Combine the animation and music techniques pioneered by Christopherson with the challenge of his first fast-moving arcade game and you have VOYAGE TO VALKYRE!

You speed through a magical maze guarded by ferocious birds that swoop down to attack if you don't get them first. To list all the play and options of this exciting game would take the 16 pages of instruction included.
16K tape...\$34.95
16K disk...\$39.95

DUEL «N» DROIDS

By Leo Christopherson from Acorn
Your 'droid has already learned NIM, so now it's time to teach it how to wield a laser sword! Starting out as a lowly clown, you teach it how to use a laser sword by controlling its movements -- advance, attack, even retreat if necessary. After training it to be a "Grand Master," you enter the tournament against the program's skilled 'droid. Revel in the fan-fares of the victorious -- or hear the funeral dirges of the defeated! Entertainment for all ages.

Protected tape...\$14.95
Protected disk...\$20.95

Our Most Popular

Unbelievable Realtime 3-D Graphics!



FLIGHT SIMULATION

From Sub-Logic
The wait is over! If 3-D graphics seem impossible on the low resolution TRS-80, you haven't seen this brilliant program. During FLIGHT SIMULATION, you instantly select instrument flight, radar, or a breathtaking pilot's-eye-view. But be sure to strap yourself in -- you're liable to get dizzy!

Once you put in some air time learning to fly your TRS-80, head for enemy territory and try to bomb the fuel depot while fighting off five enemy warplanes. Good Luck!

Model I, 16K tape...\$25.00



PRO-PIX '81

By Tally-Ho from Adventure Int.
This ingenious program provides a computer projection of the winners and point-spreads for the 1981 professional football season. Each week you enter the current scores into this self-modifying program, and it updates the strengths and weaknesses of each team. Forecasts are designed to become more accurate as more data is accumulated.

32K disk...\$24.95



By Chris Crawford from Avalon Hill
In this combination computer and board game, you control up to eight German tanks or anti-tank guns against the computer's Russian forces. It all takes place on the eastern front of WWII and rages through a landscape of forests, lakes, roads, and rough terrain. To beat the computer you must develop good armored tactics and judgement, but have a willingness to take risks.

16K tape including colorful wargame board...\$23.95



By John Allen from Acorn
You have to be fast to keep up with the action as you try to outscore your opponent in five minutes of one-on-one basketball against a friend or your TRS-80 model I or III.

16K protected tape...\$14.95
16K protected disk...\$20.95

Game of the Year



DECATHLON

By Timothy Smith from Microsoft
The graphics capabilities you were promised when you bought your computer are finally utilized in this marvelous series of programs. Just like the real Decathlon, you compete in 10 demanding games that encompass different forms of running, jumping and throwing. Play alone or with as many as eight competitors.

You MUST see this system in action. Otherwise, you simply won't believe the combination of outstanding graphics, fast-paced action, nail-biting intensity, and even a touch of comedy you'll experience with Olympic Decathlon!

Model I, 16K tape...\$24.95 32K disk...\$24.95



By John Allen from Acorn
More features, thrills, and sound than even John Allen's famous PINBALL. Once you load ASTROBALL into your TRS-80, the arrow keys become flipper buttons, the screen becomes the play board, and you become the "Pinball Wizard!"

A flying saucer, spaceships, meteors, and black holes add to the fun as your ball realistically zings around the board. ASTROBALL will have all your family and friends lining up for the pinball action and challenge. Five skill levels.

16K protected tape...\$19.95
16K protected disk...\$19.95

PINBALL

By John Allen from Acorn
Get your flipper fingers ready for action in this real-time, machine language game.

Lots of sound and flashing graphics make this fast action game so much like the real thing that you'll have to remind yourself not to shake your TRS-80. Choose from five playing speeds to match your skill. Can you beat your friends' scores? Will you avoid the infamous "Bermuda Square?" Get PINBALL today and find out.

16K protected tape...\$14.95
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Crush, Crumble and Chomp!

From Epyx
It's a monster movie, and you are the monster! You can be The Glob, Kraken, Mantra, Mechismo, Arachnis, or Goshilla -- or even design your own "custom" monster (disk version only). This hilarious action game is loaded with graphics and sound as you practice your villainy. With 6 monsters, 4 cities, and 5 game objectives, you get a choice of more than 100 possible scenarios. A monster's life is not all carnivorous crunching, though: The combined resources of the police, science, and armed forces are bent on your destruction.

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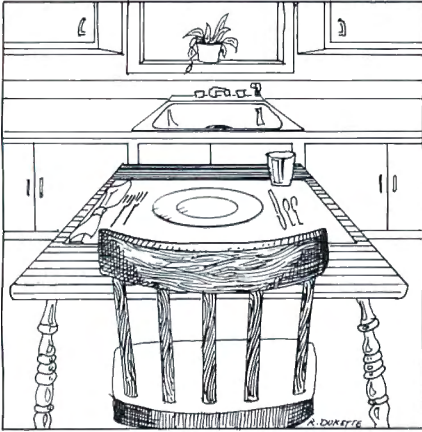
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News From KITCHEN TABLE SOFTWARE, INC.

by David Busch



The TLS-8E microcomputer—flagship of Kitchen Table Inc.—has reached full maturity with the recent announcement by that fictitious firm that a new comprehensive line of retrofixes, enhancements and optional repairs for the model's design defects will be offered later this year.

The new upgrades are welcomed by all serious S-80 buffs. Astute observers will remember that as long as Radio Shack was able to keep creating cassette loading modifications, buffered expansion interface cables and mods, lowercase fixes, and other corrections, the TRS-80 Model I remained a popular, viable product. It was only after the computer was semi-perfected it became necessary to introduce the Model III and a corresponding new round of debugging.

So I viewed with great pleasure the 213-page addenda, errata and corrections manual arriving at my home late last week. It meant the United States' only Z79-A-based microcomputer was gaining new ground. I quickly sifted through the mass of data to glean the items of most interest to *80 Microcomputing* readers and put through a collect phone call to KTI to ask for clarification on a few points. Here are the results of my research.

A Trip to Sri Lanka

The most important offshoot of the modification campaign is the institution of a brand-new network of authorized repair

service centers for the TLS-8E. My Tandy-loving friends crowed about how simple it is to take their computers to their local Radio Shack for repair. After little more than an hour disconnecting cables and unplugging AC cords, they can cart their portable, 97-pound microcomputers for a session with diagnostics specialists. My TLS-8E, my friends point out, has to be shipped to the KTI factory in Sri Lanka just to replace a fuse in the power supply.

No more. Qualified, independent service shops throughout the nation have been recruited by KTI. Each repair center is supplied with a free TLS-8E technical manual, exploded drawings showing how the computer looks after it has exploded, and a hot-line number the service technician can call at any time—night or day—to find out the correct time and temperature.

An intensive training course, conducted by telephone, ensures each authorized repair center has at least one person who can recognize the TLS-8E on sight as a computer.

Having nearby service can be extremely comforting. In my town, repair is offered by Vito's TV Sales & Service. Last week I had to take my TLS-8E to replace a defective fuse. I went back the next day for an estimate, and they told me they'd have to send away for parts. Now, that's what I call knowledgeable, fast service.

Your local repair center can install any of the following mods for you or if you can tell the business end of a soldering iron from the handle, you can do the work yourself.

Many of you have been highly vocal in your complaints about keyboards installed in the early TLS-8E units. For some unknown reason, a significant minority prefer the QWERTY key layout found on some other computers and many office typewriters.

To meet these needs, KTI has introduced an expansion keyboard for the TLS-8E. It can be described in one word: huge. In addition to a full complement of keys silk-screened with the usual alphanumeric characters, it has a bunch of other keys with their tops obscured with masking

tape. I found strange markings under the tape: QPOUNDER/CHEESE, FF, LGCOKE, FILET and BMAC. I couldn't figure what these special function keys or the cash drawer located under the keyboard could be used for. Then it hit me: KTI had cleverly bought a bunch of surplus keyboards from some supplier and recycled them for lucky TLS-8E users.

Name That Tune in Five Bytes

Those of you who elected to stay with the stock TLS-8E keyboard haven't been forgotten. Kitchen Table has introduced a pair of modifications of interest to you. The first is a keyboard debounce kit. It is a jar of rubber cement and a foam rubber pad which can be glued to the bottom of the keyboard.

More practical is a sound-feedback kit. When installed, the mod produces a tone when a key is pressed. This lets the user know an entry has been made. A clever touch has been added by KTI. Each key depressed produces a different sound, so users with perfect pitch can determine which key was hit without looking at the keylabel.

This innovation introduces some interesting possibilities. Typing in certain keywords produces recognizable bits of song. For example, entering "print using" generates the first two bars of Johnny Carson's theme song. "On error Goto 1200" produces the opening measures of Beethoven's Fifth Symphony. My family and I spent an entire evening playing a game we invented: "Name That Tune in Five Bytes."

I discovered, by accident, how the inverse procedure works. By referencing sheet music and entering the tune at the keyboard, some interesting program lines result. Barry Manilow's "Mandy," yields a pretty nifty data base management program. I invested two days inputting Handel's "Messiah," and found it produced a Basic version of "Mystery Fun House." Quite a revelation!

17-Jewel, Swiss-Made

Another hardware defect in the TLS-8E has been the lack of a real-time clock. The

system has always had its own internal clock—even if access was denied to the user. Because the TLS-8E has this internal clock, it would seem a simple matter to make it available to the user. However, KTI has offered a hardware solution: an add-on clock. The unit is described as the only "17-jewel, Swiss-made real-time clock available for a microcomputer." I plan on adding this feature to my TLS-8E as soon as it becomes available.

A second generation of TLS-8E ROMs has been introduced by KTI. They reduce available memory by 255 bytes and add no new features. The firm has also unveiled a new, one-chip ROM nearly identical to the previous version in function, but with completely new jump vectors to the ROM routines. Our usually reliable KTI source explained this change was made to confuse programmers who insist on using undocumented addresses in their software.

The latest ROMs, with the routines shuffled in an interesting manner, were introduced for two reasons, KTI reports. The company has a new SUPERDUMPMAP II it hopes to sell to all SUPERDUMPMAP I

owners. In addition, Kitchen Table has found the previous ROMs had an alarmingly short shelf-life and needed to be reprogrammed at intervals. It seems the Sri Lankan factory thought ROM meant Remember Only Momentarily.

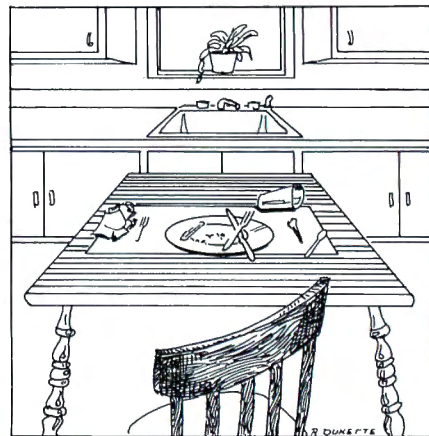
I won't go into the other retrofixes and modifications. They are obscure changes of interest to only a few TLS-8E users. One, for example, provides a means of isolating the CRT chassis from the keyboard. Even a non-hardware type like me can see the CRT is already isolated from the keyboard. In fact, nothing connects the two at all, except for few feet of wire and ribbon cable. Why bother with this one?

Red-Blooded American Modifications

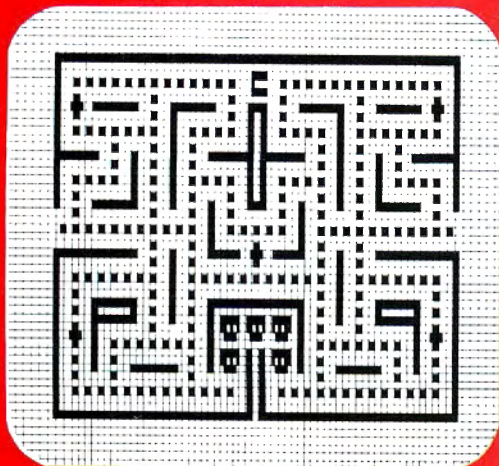
My recent talks with KTI personnel indicate the company is firmly committed to improving both its hardware and software expertise in the future. The firm is not relying totally on the design skills of its Sri Lankan factory team. Several of the new modifications were developed by red-blooded Americans. And the KTI double-

density board (The DOUBLOON) was designed and built by a KTI shipping clerk who gained considerable electronics knowledge by building three HEATH kits (including his own color television that can predict the weather.)

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80 ACCOUNTANT

by Michael Tannenbaum C.P.A.

If the microcomputer suffered from an image problem, it doesn't now. The Great Computer Company IBM has joined Tandy, Commodore and Apple and spawned a microcomputer. Suddenly, small computers are now legitimate. Prestigious publications like the *New York Times* and the *Wall Street Journal* are running feature articles on the coming revolution in personal data processing. For those of us who have been participating in the data-processing revolution, this is heady stuff. After years of defending our "clever little toys," it is difficult to restrain a triumphant grin and cheery "I told you so."

Unfortunately, these new small computers complicate the market. Instead of a small selection of microcomputers available from a limited number of vendors, there will be an abundance of devices available from any number of major retailers. For people selecting a computer, this market will be a strange and confusing place.

The Competition

An early question will be: Compare Radio Shack equipment to IBM. Based on initial information, the IBM two-disk system will cost more than a Model III with about the same capacity. The cheapest IBM unit will be three times the price of a Color Computer with the same capacity. No personal computer configuration comparable to the Model II is available from IBM.

Can the IBM Personal Computer meet the requirements for successful business installation? The Great Computer Company has the resources and skill to market its product successfully. A problem will be selling the unit through retailers, not directly to the user. The firm will lack the short communication channel between vendor and consumer proven important in correcting problems in Tandy hardware and software.

It will take time for IBM and other new vendors to overtake Tandy's lead in applications software. The some 300,000 computers sold by Tandy have created an enormous market. There is also a large amount of user-designed software available. It is safe to say there is a program for almost any need for Tandy equipment.

Aware of this, IBM and other vendors have announced their hardware is compatible with the CP/M operating system. Almost all CP/M software will be usable on these new computers. This will no doubt make CP/M the defacto standard for microcomputers and encourage an explosion of new CP/M applications.

That explosion should not affect Tandy models. Those products are CP/M compatible, although the Models I and III are limited due to their read-only lower memories. That restricts available memory and could disqualify those models from some CP/M applications. The Model II has none of those limitations and functions effectively in CP/M.

It is a data processing axiom every new piece of computer equipment requires a settling down period until the kinks are worked out. Veteran Model I users recall the early days when TRSDOS was flaky and the central processing unit often lost contact with the expansion interface. Every session was a new and uncertain adventure. Purchasers of new IBM equipment will no doubt go through a similar experience. They will be unable to go directly to IBM for assistance; they must return to the primary vendor. If he or she cannot repair the computer, the owner may have to send the machine to an authorized repair station at his or her expense.

Although the record of Tandy's repair centers has not always been good, at least they are in place. There have been enough problems and upgrades in Tandy's 300,000 computers to build a knowledgeable national repair staff. Tandy's philosophy calling for the repair centers to support the retail operation benefits the customer. A retail store manager is an important ally when a repair center can't fix the problem.

At this point, I believe Tandy products are still a good choice for anyone impatient with the problems linked to new computers.

New Mailing List Program

This month's software mailbag included MAIL-X from Micro Architect Inc. The system from the Arlington, MA firm includes a report writer generating up to 10 report formats applied to the data base.

Each format specifies the report's name and filtering criteria used to limit the records accepted for printing. The report writer includes four sort fields to arrange data in proper sequence.

MAIL-X has a greater capacity than Radio Shack's MLS II. The Micro Architect product can pack up to 3,200 records on a disk (10,000 on a four-drive system) and files can span disks. However, MAIL-X does not interface with Scripsit, Radio Shack's text editing program.

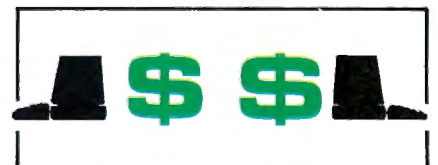
The system from Tony Pow's firm is also more flexible than MLS. MAIL-X can be set to indicate the dates of a record's creation, expiration and last time referenced. Using this feature, the Micro Architect system can act as a data-base manager for a subscription fulfillment system. If you select the expiration date option, the system will automatically enter a date 365 days in the future when a new record is added. To provide an audit trail, the system offers the option of creating a new data entry log in the file maintenance mode. This printout is essential to process inquiries from subscribers.

The system also offers more flexibility than MLS when defining file formats and record sizes. Field sizes and names can be altered allowing the program to be used for other list-processing applications. I adopted the program to control equipment deliveries during installation of a large data-processing system.

Micro Architect's long experience with Radio Shack hardware is apparent in MUTIL, one of eight programs in the system. This file utility can extend the size of a data base, delete bad records, append files and change passwords.

I found moving from program to program in the system difficult. Unlike MLS II, this system is a series of unlinked programs. Some menus are present, but often a program can only be called by returning to TRSDOS and executing a do-file.

Each program signs on with an initial-



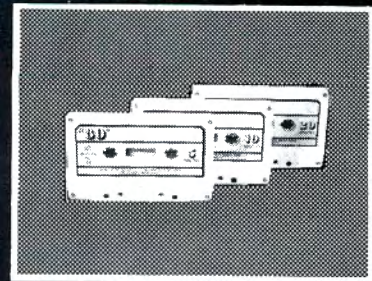
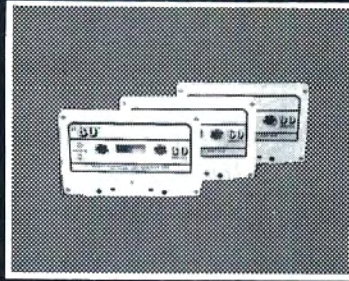
zation menu and options list. After going through this sequence many times, the sign-on protocol becomes annoying. This system needs one-time initialization and a transfer file. If parameters need to be changed, the routine in the transfer file could be called up and changes made. All sign-on parameters should be satisfied by the transfer file.

I cannot comment on the system's documentation; I received an early release of the system with a preliminary manual.

I did not have time to enter a large enough data file to test the sort-merge features of the system. This routine is called when a file is greater than available memory. The largest file I tested was about 70 records. With a file that size, the sort is almost instantaneous.

MAIL-X requires a more knowledgeable operator than the MLS II. However, an experienced Model II owner should be able to work with the system without difficulty. Since the programs (with the exception of the sort) are in Basic, the user may customize them. The code is well-written and easy to follow—even a file layout is provided for the programmer. ■

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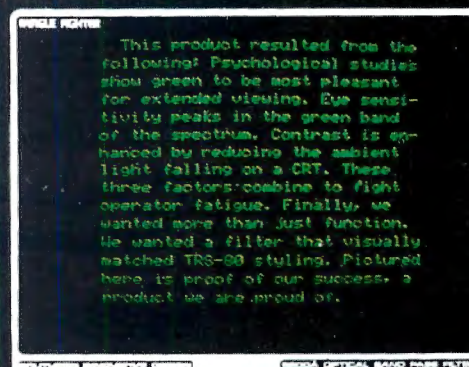
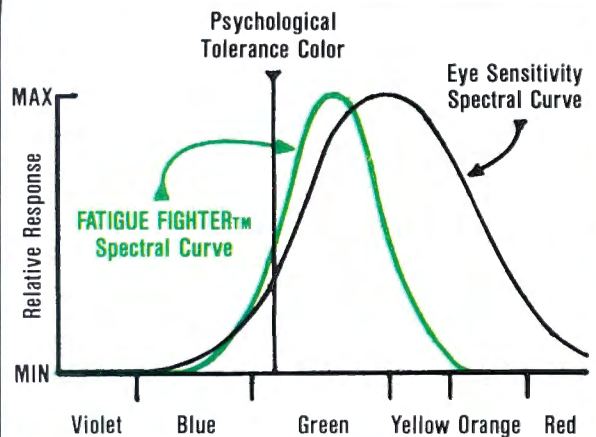
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Xerox, IBM storm market, pull wraps off their micros

Xerox and IBM have challenged the hold Tandy/Radio Shack, Apple Computer Inc. and Commodore International Ltd. have on the small business microcomputer market. A 16-bit microcomputer selling for \$1565 and a data and word processing system with multiple work station options have been introduced by IBM, while Xerox' 820 desktop model has word processing, printer and software options. Both companies are competing for the small businessman, who is, in many cases, a first-time computer user.

Thus far Tandy's reaction to their new competition has been blase. "I don't think we're going to lose any business because of it," says Jon Shirley, vice president of the Fort Worth, TX, firm's computer division.

Though Tandy won't release sales fig-

ures, market analysts estimate they hold about 25 percent of the personal computer market, with Apple of Cupertino, CA, garnering about 22 percent and Norristown, PA-based Commodore 20 percent. Shirley says about 96 percent of their Model II units have been sold to small businesses.

What can Xerox and IBM offer the business user that Tandy cannot? Both companies have a respected service network and a sales force with many contacts in the business world. Their micros are also compatible with other company products. They will compete with the Model II, but the question is how much and how soon.

These new machines "will not have an immediate effect," says market analyst Al Hirsh of Datapro Research Corp., Delran, NJ. Hirsh feels that the new com-

puters will have the swiftest impact on Tandy's major accounts because their competitors have so many business contacts.

Other marketing people think the new computers—particularly the IBM personal computer—will affect Apple computer's sales more than Tandy's. "The IBM personal computer is aimed smack at Apple," because its price and capabilities are similar, says Gerald Hallaren of the Yankee Group, a Cambridge, MA, market consulting firm. Nonetheless, all three new computers will be marketed with the small businessman in mind and are bound to cut into Tandy's share of this boom market.

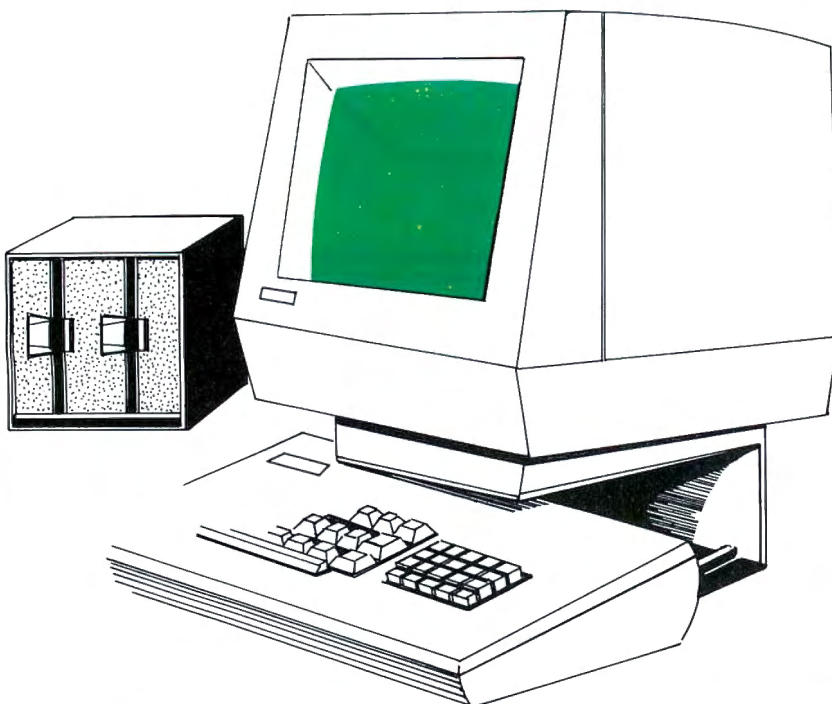
Datamaster

At almost \$10,000, the most expensive of the new competitors is the IBM Datamaster, but experts don't agree on whether the cost will affect sales. Some think the IBM name will be enough to sell the system. David Folger, a consultant with International Resource Development Corporation, Norwalk CT, thinks Datamaster will be bought by "people willing to spend more money than they have to."

"IBM's cashing in on their reputation," agrees Stan Green of Datapro. He contends users are willing to pay \$5,000 to \$6,000 more for an IBM product based on the Armont, NJ, firm's reputation alone.

Consumers will pay a base price of \$9830 for a single IBM computer work station and an 80 character per second printer. The computer features 128K of RAM and 112K of ROM. The terminal display is the standard 24 by 80 and features upper and lowercase and five character sets, including Nordic and Spanish.

The system's dot-matrix printer is bi-directional. A second printer is available at \$3200. To achieve letter quality printouts, IBM uses a strike-over mode that reduces



speed to 40 cps. This option costs \$3500.

Single or dual disk drives are available and users can add another disk unit to the system. Each drive contains 1.1 megabytes of storage; when the 5246 disk unit is added, each work station will have 4.4 megabytes of storage. Total memory with two work stations is 6.6 megabytes.

What IBM considers the system's most attractive feature is the ease additional work stations, disk drives and printers can be added as a company's business grows. Up to four printers (and two disk units) can be used with two work stations.

The Datamaster also comes with a word-processing option ranging from \$1100-\$2200. The circuit card costs \$600 and the software is \$500. If the user wants a letter quality printer, it's \$1100 more than the 80 cps printer.

Smaller IBM

IBM's smaller personal computer offers many of these features at a much lower price. The standard system includes 16K of memory, keyboard, cassette jack, speaker, and Basic language interpreter. IBM has made it easily adaptable to word processing. There are 10 keys for scrolling and editing; an upper and lowercase display; and a dot-matrix printer option with page spacing and column skip. The printer runs at 80 cps and features 12 type styles. Easywriter, the word-processing software, is a comprehensive text editor without automatic hyphenation, repagination or scrolling.

A 64K system with single disk drive and a display costs \$3005. A full business system, including two drives and a printer, costs \$4500.

Up to 256K RAM is available, with 40K ROM; up to two disk drives can be attached with 160K per disk. An RS-232C asynchronous adapter hooks the system to data bases and other computers. Because the personal computer uses the CP/M operating system, a host of programs are available for it, including the Visicalc financial package, Peachtree Software's accounting programs, and communications software allowing access to data bases and other computers.

Xerox Entry

Xerox' 820 computer also supports the CP/M system and has word-processing capabilities. Though less powerful, its features are strikingly similar to IBM's—a 96-character ASCII format with a 10-key numeric pad; dual 92K byte single-sided mini-floppy Shugart disk drive; and standard 64K RAM with 4K ROM. A dual RS-232C port connects printers and other communicators. Xerox is pushing the

daisy-wheel Diablo 630 printer as an 820 option; the \$2995 printer is bi-directional with 40 cps letter quality output.

Their \$495 word-processing package has a long list of features. Text editing functions include global find and replace, standard insert and delete, auto return and a command moving copy from file to file. Text formatting includes pagination, headers and footers, reformats, tabs, margins, auto centering, justification and super- and subscripts.

The Key

Software will be the key to whether these systems are marketable, says Karen Horowitz of the Venture Development Corp., Wellesley, MA. "People won't be buying 64K memories, they'll be buying solutions to problems."

Since IBM's Datamaster is not CP/M based, the firm is offering its own business accounting package—for a whopping \$6150. The six program package includes billing, accounts receivable, accounts payable, inventory accounting, payroll and general ledger. A unique feature of the package is the ability to enter information from one program and have it automatically transferred to another without re-keying.

Another software package, Brads III, will soon be available. It's designed for unique business applications like sales

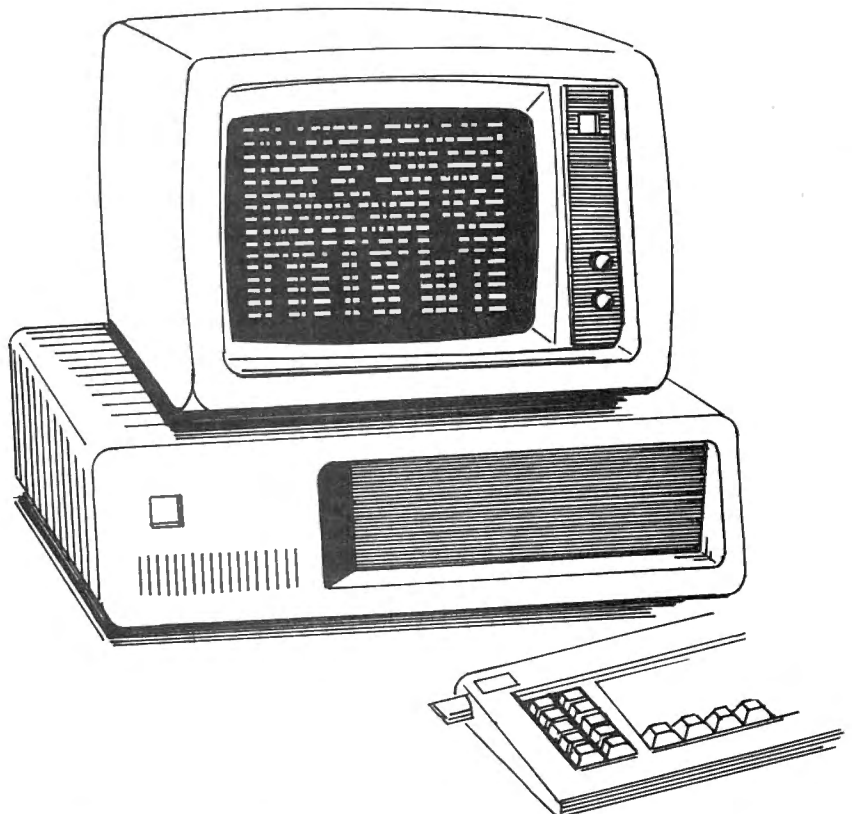
analysis, and costs \$1145. An IBM spokesman said he was confident people would be writing software for the system.

Though the Datamaster's software is more expensive, some say the small businessman would rather pay the extra price in exchange for adequate user support. Hirsch of Datapro praises the IBM software package for its integration and says many first-time users prefer company-backed software to dealing with third-party distributors.

With the Datamaster and personal computer so far apart in price range, there's also the question of their competing with each other for the small business market. But marketing experts seem to agree the two will appeal to different camps in the business field.

"The type of guy who keeps his own books will go for the personal computer," says Hallaren of the Yankee Group. Larger businesses with a bookkeeper or two would be better suited to the Datamaster because "it's fantastically easy to use" and has multiple work stations.

Others say the personal computer is the more attractive of IBM's offerings. "The Datamaster is over priced (and) there's nothing technologically advanced about it," says Hirsch. The personal computer, on the other hand, has word processing and communications links with other systems and could even be convert-



ed to hard disk. One million of them will be sold by 1985, he predicts, while after 50,000 Datamasters are sold by next year, the machine will be "put to rest," because of its expense and incompatibility with other units.

But IBM's promotion of the Datamaster will be heavy. They're sinking \$3 million into a 90-day television ad campaign, as well as a radio and print blitz.

Different Views

Experts differ on the importance of price to the small businessman. Some say the first-time user is reluctant to make a large investment. "The first-time user isn't going to pay that money as readily. He has to be convinced of the economic value (of the product)," says Francis O'Reilly, an independent marketing analyst in Ardsley, NY.

An analysis by Venture Development Corporation also stressed the "need for small businesses to increase profits without making a large capital investment."

Both IBM and Xerox have respected and recognized names in business circles. "Like we used to say in the data processing business, nobody ever got fired for buying an IBM computer," observes Bishney. Their reputation for service and reliability could hurt Tandy, whose pitch for major accounts is "in its infancy," Hirsh says.

Sales Approach

Ultimately, what may matter most in the micro market is not cost and function, but how the companies sell and distribute their products. The appeal of Xerox and IBM to businessmen will be a key factor in product promotion. Both are disseminating their products in a variety of ways. Dallas-based Xerox is relying on their 500-strong sales force, office dealers, distributors, and 25 outlets. Datamaster will be sold via IBM's General Services Division, using 50 outlets and their three main product centers—Baltimore, Philadelphia and San Francisco. A personal computer marketing organization has been set up within the Data Processing Division. They also have a mammoth sales force.

Because it costs IBM \$100 every time a salesperson calls on a customer, the company is establishing seminars bringing clients to the company according to Hirsch. Whether these seminars will accomplish as much as visits to customers remains to be proven.

Retail Outlets

What's new for both companies is the use of retail outlets to distribute their products. Xerox will sell the 820 at retail outlets such as Computerland; IBM is sell-

ing its personal computer through 200 Computerland stores, five Sears, Roebuck and Co. business machine stores, IBM product centers and a sales arm of its Data Processing Division.

But retail stores may not be the best way to reach the small-business owner. A Venture Development survey indicates only a small percentage of users bought their systems at a retail outlet; an even smaller percentage of potential users would consider buying a retail computer.

Apparently, small businessmen—particularly first-time computer users—consider company back-up more important than any money they save at retail outlets. Buying direct through salesmen or company outlets appeals to the novice, who needs a lot of "hand-holding" from the company.

Anticipating this, IBM is offering complete service back-up for the personal computers sold through Sears outlets. Maintenance contracts will cost 13 percent of purchase price per year. They have also set up a toll-free line for Data master users.

How will Tandy's distribution match up? With 2,000 dealers, 168 computer centers and 4,800 retail stores, they've pretty much got the field covered. They also have some direct accounts sales people, though this is certainly not their strongest point. Shirley of Tandy thinks their retail

units are the key to escaping the influx of IBM and Xerox. "They're selling them in stores where they sell Apples and PETs," he says, theorizing those two producers will feel the brunt of the competition.

Micro Versus Mainframe

Though they are making a healthy stab at the micro market, both Xerox and IBM may have problems divorcing their microcomputers from larger office products. Marketing analyst O'Reilly says IBM must alter its marketing approach to maintain all its product lines. "I think IBM should divide itself like an amoeba," to accommodate microcomputers. However, he is skeptical of their mass market capability. "I don't think IBM has had any experience in high volume production."

O'Reilly also questions Xerox' credibility because of their abrupt withdrawal from the mainframe business several years ago. At that time Xerox bought Scientific Data Systems, whose mainframe product had an "esoteric" application, according to Xerox spokeswoman Marcie Williams. Xerox' forte is mass production, not customized products, she says. The new 820 blends in much better with their mix of office products.

Both corporations have worked hard to fit the micros into larger offices as well as small businesses. Datamaster and the

IBM micro's nitty gritty

Computer boasts speedy microprocessor

The new IBM Personal Computer is a machine designed for business, school, and home use. This is the lowest-priced computer system IBM sells, with prices ranging from \$1565 to \$6300.

Standard equipment includes: a detachable 83-key keyboard; a cassette tape jack; five expansion slots for additional memory and display, printer, communications and game adapters; built-in speaker for music programming; automatic self-test of components after power-on; an enhanced version of Microsoft Basic; 16K characters of user memory; and a high speed 16-bit microprocessor.

The system can accept two 5.25-inch disk drives. The memory is expandable up to 256K bytes. Either a monitor or a television with radio frequency modulator may be used to pro-

vide a display of 25 lines of 80 characters per line.

Software already available for the IBM Personal Computer includes: a disk operating system; a Pascal compiler; CP/M and the USCD p-system; VisiCalc; general ledger; A/R; A/P; a word processor; Microsoft Adventure; and communications software to use the optional RS-232C asynchronous adapter.

Service for the IBM Personal Computer will come from IBM and from a nationwide network of authorized dealers.

First deliveries of the IBM Personal Computer are scheduled to begin in October. ■

by Bruce Metzger
Data Processing Manager
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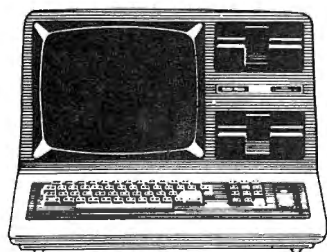
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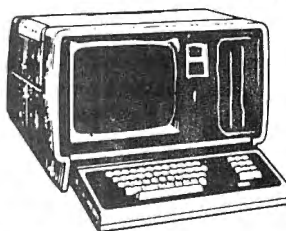
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Xerox 820 are compatible with other company products.

The Datamaster, which many feel is a redesigned version of the ill-fated 5100 series computer, features business level Basic compatible with the IBM System/34. Also available is an \$875 software package that converts 5110 and 5120 Basic to Datamaster Basic.

Local Networks

Xerox' 820 can be used with Ethernet, the company's communications network. A user simply needs an RS-232C board and communications server. Some manu-

facturers, including Intel Corp., are working on a chip for a direct connection.

It's also rumored IBM may soon release a communications system similar to Ethernet to be linked with the personal computer. An IBM spokesman denies this however.

With the business end of the microcomputer market growing the fastest—Venture Development predicts it will total \$2 billion annually by 1984—companies will have to meet the needs of the small businessman. This means cost-efficient systems, adequate software, user support and ample memory. But to capture the

brunt of the market, companies like Tandy must compete for the major accounts sales to larger companies. That's where Xerox and IBM hit the hardest.

Everyone but Tandy is taking the entrance of these corporate giants seriously. Speculation was rampant on Wall Street after IBM's 16-bit personal computer debut. But Tandy remains non-plussed. Shirley of Tandy contends they have the market cornered and "everybody else can go fight it out among themselves." ■

by Betty Thayer
80 Microcomputing staff

Bill targets computer crooks

Nelson of Sunshine State takes aim at purloining programmers

A bill making many kinds of computer crime a federal offense has been reintroduced into the US House by Rep. Bill Nelson (D-FL). The bill would mobilize the resources of the FBI and federal judiciary system to fight the rise in computer crime.

Known as the Federal Systems Protection Act (H.R. 3970), the new bill is presently before the House Judiciary Committee's Subcommittee on Civil and Common Law. Hearings have not been scheduled on the measure yet.

The bill is the latest version of a proposed act sponsored for four years by retired Sen. Abraham Ribicoff (D-CT) and reported out of a Senate subcommittee at the end of the 96th Congress last year.

The bill makes it a federal offense to use, for illegal purposes, a government computer or a private computer owned by a firm involved in interstate commerce or owned by a financial institution insured by the federal government or in the Federal Reserve System. It also makes acts of destruction against any such machines a federal offense.

The bill provides a fine up to twice the proceeds from the illegal act or \$50,000, whichever is greater, and imprisonment for up to five years.

Congressman Nelson represents an area of Florida hosting several high-technology companies. He sponsored Florida's first computer crime legislation while a state legislator. That bill, the Florida Computer Crimes Act, became law in 1978 and was the first state law to deal directly with computer crime.

Critics

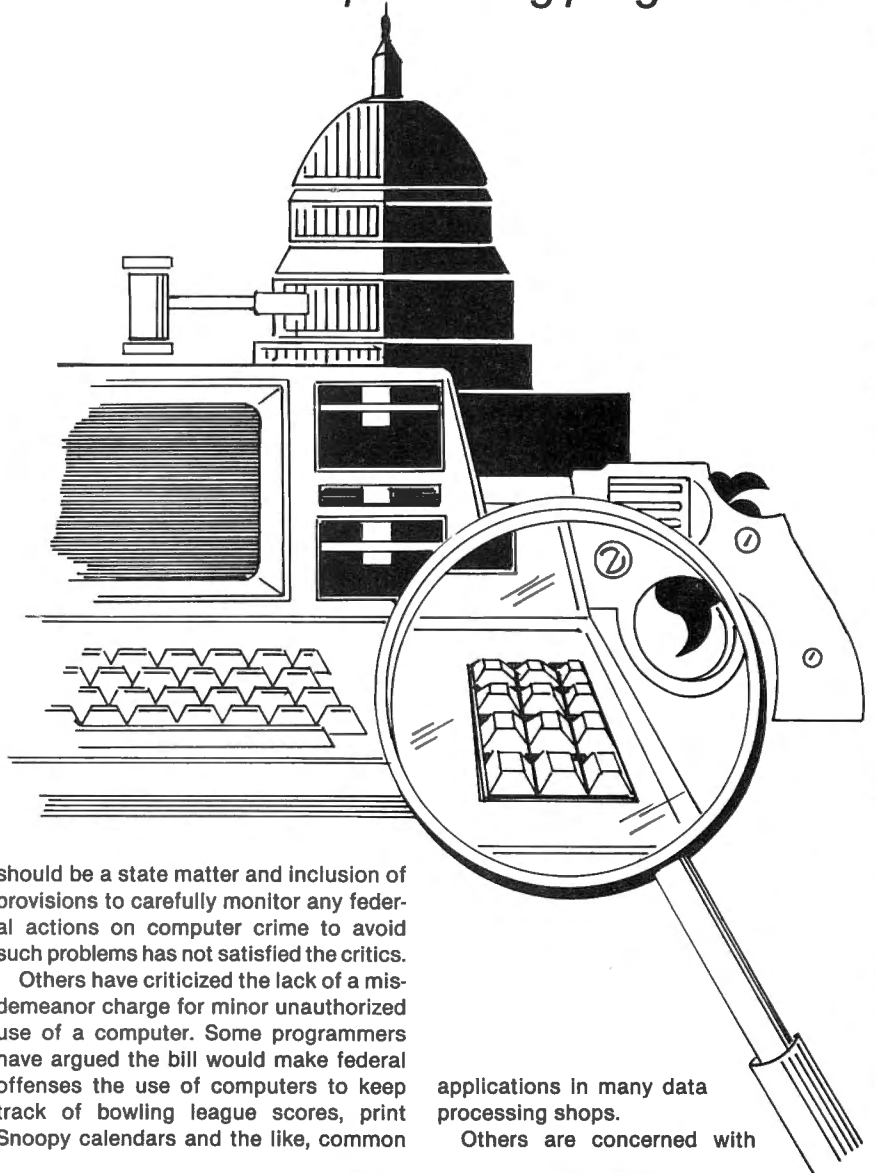
Some critics feel the bill in Congress will create federal intrusion into what

should be a state matter and inclusion of provisions to carefully monitor any federal actions on computer crime to avoid such problems has not satisfied the critics.

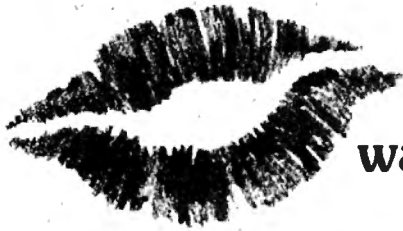
Others have criticized the lack of a misdemeanor charge for minor unauthorized use of a computer. Some programmers have argued the bill would make federal offenses the use of computers to keep track of bowling league scores, print Snoopy calendars and the like, common

applications in many data processing shops.

Others are concerned with



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the broad definition of computer in the bill. The bill defines computer as "any device that performs logical, arithmetic, and storage functions by electronic manipulation, and includes any property and communication facility directly related to or operating in conjunction with such a device..." The definition excludes automated typewriters and typesetting equipment, microcomputers and portable handheld electronic calculators.

Bill supporters have argued a broad definition is necessary to cover future generations of computers.

Sees a Need

In spite of the criticisms, however, Nelson believes the federal bill is needed. He says the federal government, alone, owns more than 10,000 computers. These are used, among other things, to pay billions of dollars annually to federal workers, defense contractors and recipients of Social Security benefits.

Private industry has thousands more computers handling all kinds of financial and sensitive information. Nelson notes a programmer stole \$10.2 million from Security Pacific Bank in California and transferred it to a Swiss bank account with a single telephone call. An employee of Kelly Air Force Base in San Antonio, TX, stole \$100,000 through false computer billings for aviation fuel. A business in Virginia stole information from US Department of Energy computers in Maryland by telephone. The total direct financial loss in the United States due to computer crimes is estimated at between one and several hundred million dollars annually.

However, Nelson said, no federal law clearly covers the use of computers in crime or their damage by terrorist-type attack. The 40-odd federal laws covering various aspects of the issue were all written long before computer crime existed as a major problem.

Nelson admits computer crime is a small part of the total problem of white collar crime in the United States. However, he maintains thousands of Americans today are familiar with the strengths and weaknesses of computers and have both the knowledge and opportunity to commit computer-based crimes. For this reason, he has reintroduced the bill in spite of its less than spectacular progress through Congress in the past.

No Great Following

Although Ribicoff sponsored the bill in the last two Congresses and succeeded in getting it reported out of subcommittee, it was never acted on by the Senate. With the start of the new Congress, it would

have to go back to the subcommittee if someone sponsored it in the Upper Branch. So far no one has. In the House, it never got out of subcommittee, partly because the House Judiciary Committee's Chairman, Peter Rodino, Jr. (D-NJ) does not favor the bill. Nelson's administrative assistant, Jim Southerland, said that situation has not changed and admitted the bill has not attracted a great amount of interest in Congress.

This time around Nelson hopes to open communications with concerned persons to learn their views on computer crime and inform them on the need for the bill and its purposes. His office is preparing a

mailing to government officials, business leaders and other involved individuals to determine the level of interest and need for the bill. Southerland said Nelson would welcome comments from interested parties.

Persons interested in the bill can contact Southerland at Room 307, Cannon House Office Building, Washington, DC 20515. Those interested in contacting the Subcommittee on Civil and Common Law may write to its chairman, Rep. Don Edwards (D-CA), and those interested in communicating with the full committee may address their remarks to Chm. Rodino. ■

Dartmouth fetes John G. Kemeny, father of Basic

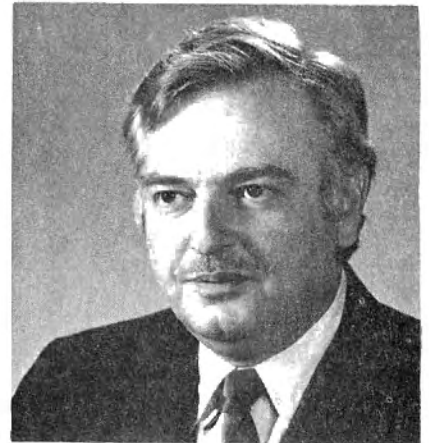
The father of the popular computer language Basic was honored recently by the university he has served for more than 25 years. Dartmouth's John G. Kemeny, who last fall stepped down after 11 years as the college president, has had an academic chair established in his name in the mathematics department.

The John G. Kemeny Parents Professorship in Mathematics is a \$1 million distinguished professorship. The endowment is a gift from three non-alumni parents, who have chosen to remain anonymous, and given in appreciation of Kemeny's service to the university and to the country.

Pioneering Author

Kemeny was a pioneer of computer time-sharing techniques and one of the first educators to recognize the importance of computers in higher education. His time-sharing system at Dartmouth became the model for other systems in academic and business environments. In addition, Kemeny's Dartmouth Basic found great popularity among his students and proved so easy to learn it was adopted by the computing public as the most comprehensible computer language available.

Fleeing the German persecution of Jews in his native Hungary in 1940, Kemeny came to this country as a 13-year-old student. His affinity for mathematics and science was soon obvious to his teachers at George Washington High School in New York City, and by the time of his graduation, he was accepted at Princeton University in nearby New Jersey. While at Princeton, he was recruited by the government to work on the Manhattan Project at Los Alamos, NM. Here, as he assisted in



the development of the atomic bomb, he rubbed shoulders with some of the best scientific minds of the time including Jon Von Neuman, Edward Teller and Eugene Wigner.

When his work at Los Alamos was completed, Kemeny returned to Princeton to pursue his doctorate in mathematics. While completing his graduate studies, he was research assistant to Albert Einstein and became an advocate of World Federalism—a movement for the sensible human control of nuclear technology.

In 1952 Kemeny was recruited by Dartmouth and in two years became chairman of its aging math department. As he brought new blood into the department, he also worked on developing an easy to learn computer language. He called it the Dartmouth Beginner's All-purpose Symbolic Instruction Code (Dartmouth Basic). During this time Kemeny also set up an elaborate time-sharing system for the college computer and encouraged under-



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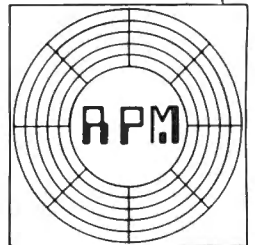
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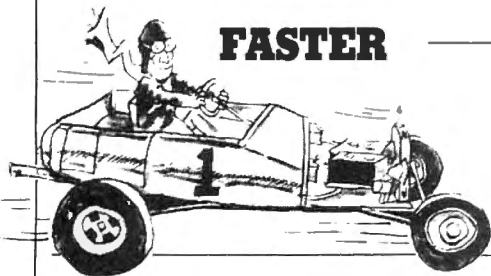
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graduates to get familiar with computers through game playing. As a result, over 90 percent of Dartmouth's undergraduate students had exposure to computers before leaving school.

Storms on Campus

In 1969 Kemeny was appointed the college's 13th president. That year and through the early 1970s, his cool style of leadership, encouraging dialog rather than rhetoric, stood him in good stead with students. Though the bombing of Cambodia and the killings at Kent State University in Ohio rocked Dartmouth as they did most other American campuses, Kemeny managed to weather the storm by suspending classes for a week, establishing a series of teach-ins and seminars and providing transportation to Washington, DC, for outraged demonstrators who sought President Richard M. Nixon's ear.

In 1972 Kemeny wrote the book *Man and the Computer*. In it he argued for a new symbiosis between man and machine. In Kemeny's view the computer was man's key to managing the increasing complexity of his future. In the book Kemeny also sought to allay the fears of the layman concerning technology. He maintained that, if introduced properly, man and computer could become fast friends and partners in the future.

The Commission

Kemeny's best known contribution in the arena of popular science is the "Report of the Kemeny Commission on the Accident at Three Mile Island." Tapped by President Jimmy Carter in 1980 to head the commission investigating the near melt-down of a nuclear reactor outside Harrisburg, PA, Kemeny later said, "As we looked at the NRC (Nuclear Regulatory Commission) overall, our most important judgement was that it is an agency hypnotized by equipment. It had a firm belief that equipment could be made fail-safe, and as a result it totally ignored the human element in nuclear power."

For many years Kemeny has sounded a similar theme in his work and today he contends man, by himself, is unable to cope with the extremely complex systems he has created. For Kemeny, the computer must play a role in helping man cope with his increasingly complex world. Kemeny's contributions toward popularizing that machine have made coping easier and computer literacy attainable for many a microcomputerist. ■

by Chris Brown
80 Microcomputing staff

News in bits and bytes tests waters for future of electronic newspapers

Two years ago if you wanted to read a newspaper, you either subscribed to it or bought it at the corner store. If you wanted to read your home town paper from 1,000 miles away, you had it mailed to you and read it three days later. Not so today—at least for microcomputer owners.

More and more newspapers and news services are becoming available to micro owners. At least three major databanks—CompuServe, The Source and Dow Jones Electronic News Service—offer electronic newspaper services, and a small Midwestern newspaper has a public database.

CompuServe of Columbus, OH, offers electronic editions of 10 newspapers: *The New York Times*, *Washington Post*, *Los Angeles Times*, *San Francisco Chronicle* and *Examiner*, *Columbus (Ohio) Dispatch*, *Minneapolis Star and Tribune*, *Norfolk (Virginia) Pilot and Ledger*, *St. Louis Post-Dispatch*, *Atlanta Constitution and Journal* and *Middlesex News* in Framingham, MA.

The Source in Maclean, VA, does not carry individual newspapers, but does carry several electronic newsletters and a wire service, United Press International. Stories from UPI go into The Source seconds after being transmitted on the wire.

The Princeton, NJ-based Dow Jones Electronic News Service includes access to the international Dow Jones business and financial wire. This service is designed for financial and investment professionals and has been available to them for several years.

Recently, Dow has made the service available to the general public and formatted some of the databases for TRS-80, Apple and Commodore microcomputers.

According to Jerry Lipski, head of computer services for the *Atlanta Constitution*

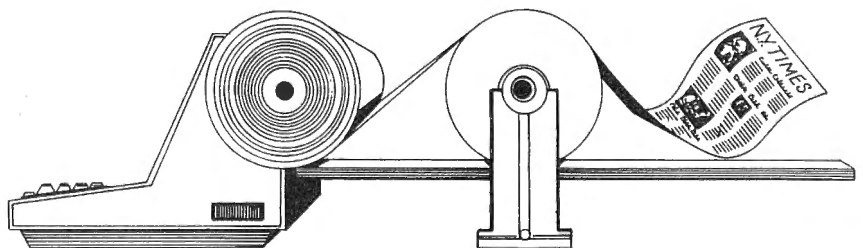
and *Journal*, electronic service is less expensive and more convenient for the newspaper but more expensive and less convenient to the reader. You can't fold up a microcomputer and read it on the train home or under a hair dryer, and you can't line a bird cage with it. Then there's the expense of buying a microcomputer or dumb terminal and subscribing to the database.

For a newspaper, electronic editions cut out some of the major costs of the business: typesetting, printing and distribution. They also allow for more flexible deadlines, since the database can be updated instantly. However, an industry source familiar with one of the existing electronic news providers said there are delays of up to three hours between filing a story and its appearance in the database.

In the CompuServe system, most electronic editions are story by story renderings of the day's newspapers. When a user asks for an edition, he or she chooses an area of interest and is given a menu of headlines. After selecting a headline, the story appears on the screen.

Lipski said the *Constitution's* electronic edition is unusual in its format and reason for existence. It only includes the full stories of the front page and other special pages. Most of the paper's stories are summarized in a few paragraphs, as is done on radio. The idea, Lipski said, is to encourage people to buy the *Constitution* instead of having the electronic edition compete with the paper.

In addition to news stories, he explained, the *Constitution* database includes a guide to Atlanta's hotels, a television guide with reviews, a schedule of airline service to Atlanta and other general interest items. ■



Height games

Simulations eyed during strike

Reporters looking for a new lead for the continuing story of the air controllers strike hit on microcomputer simulations of airport traffic control last August. For awhile, the public read and heard about products like *O'Hare*, a program marketed by Instant Software, Peterborough, NH, and *Air Traffic Controller* by Creative computing, Morristown, NJ.

The sudden media interest in the subject apparently started with a newsman for the National Public Radio network familiar with one of the games. As a result, a commentator for "All Things Considered," the network's rush-hour news and comment show, interviewed the author of *O'Hare*.

Then the *Wall Street Journal*, in the second section of its August 17 edition, ran a two-column story "For Some Would-Be Controllers, Guiding Airplanes is just a Game." After that, things really started rolling.

Marketing Manager Mary Reed said Instant Software and its distributors had contact with about 15 major news organizations including *Time* magazine and the CBS television network. A CBS affiliate in Denver, CO, had pictures of the Instant Software product, *80 Microcomputing* and *Kilobaud Microcomputing* on their evening news broadcasts. A major Boston radio station ran a four minute telephone interview with Reed on the subject. ■

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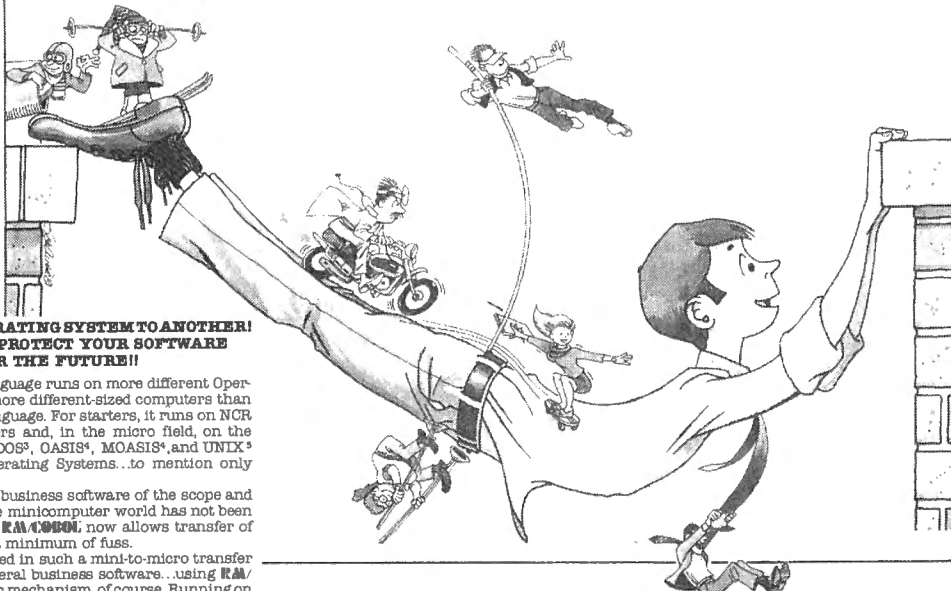
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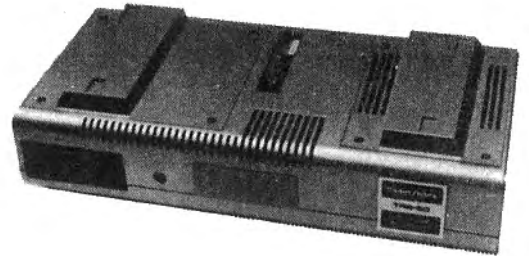
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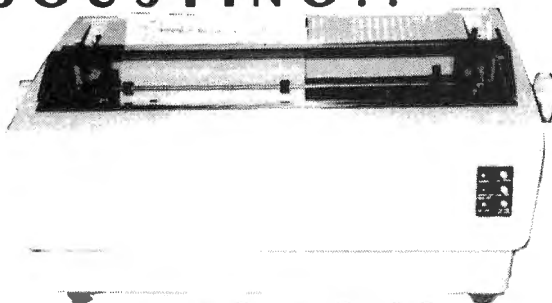
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✓520



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The MX-80 prints bidirectionally at 80 CPS in a user-defined choice of 40, 80, 66 or 132 columns. And if that's not fast enough, its logical seeking function minimizes print head travel time. The MX-80 prints 96 ASCII, 64 graphic and eight international characters with a tack-sharp 9 x 9 matrix. For a long time, Epson printers are known for reliability and the MX-80 is no exception. But that's not the best reason to buy it, either.

The print head has a life expectancy of up to 100 x 10⁶ characters, and when it wears out, just throw it away. A new one costs less than \$30 and the only tool you need to change it is attached to the end of your arm. The MX-80 is compact, weighs only 12 lbs., and the whole unit, including the two stepper motors controlling carriage and paper feeding functions, is precisely controlled by an internal microprocessor. But even that isn't why you should specify the MX-80.

The best reason is this: because Epson makes more printers than anyone else in the world, we can afford to sell each one for a little less.

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AW...WHAT THE HECK ✓521

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\$19⁹⁵
PER 16K SET

These chips are brand new "4116's". These 200 nano-second chips are fully compatible with all TRS-80 products. Instructions for insertion are included; however, the dip shunts required for converting a 4K Model I to a 16K Model I are not included at this low price.

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The Microline is built on a rugged cast aluminum base to withstand the rigors of continuous business use. It is driven by two motors and will run all day with no duty cycle limitations. Microline printers use a dense 9 x 7 dot pattern to produce crisp, clean copies, first copy to last. The seven pins in the head are "fired" using energy stored in tension members. This technology permits the use of short, low mass pins made with an extremely hard alloy. The head produces less heat, thereby extending its life.

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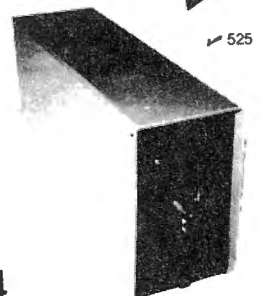
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*TRS-80 MODEL I VERSION
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TEAC DRIVES

NOTICE
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OUR DIRT CHEAP
MINI DISKS
SHOULD BE AVAILABLE
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80 APPLICATIONS

by Dennis Kitsz

“When you order Extended Color Basic be sure to ask for the kit.”

Say, folks, I've got a Radio Shack Color Computer, but one that's just a little different . . . it has Extended Color Basic with 32K memory, provides a clean,

composite video output, and displays uppercase and normal lowercase letters. No, you can't buy one exactly like it at Radio Shack (yet?), but you can have one for less

than the cost of an off-the-shelf 16K Extended Basic machine. Want one?

This month's column is a potpourri of simple Color Computer expansions I have collected over the past few months. As sold, the machine is a fine investment for \$400, but for a few dollars more you can install Extended Color Basic (\$99 from Radio Shack), two banks of 16K RAM (\$18 each from non-Shack suppliers), composite video (\$2, build it yourself), and a plug-in character board (about \$50, using the printed circuit pattern in this column).

Some folks have suggested that I make modifications just for fun. Fun isn't enough. When I purchased the Color Computer I was ready to be convinced that it needed no changes at all. It looked like the perfect second-generation personal computer. I anticipated with excitement installing my Extended Color Basic and seeing those rumored amazing high-resolution graphics come alive. Then I learned that Radio Shack didn't want me to install Extended Basic (but they would do so for an additional fee); and that the extended version required 16K RAM (which they also would install at a high price and for an additional fee).

About the same time, I borrowed a color monitor from a friend, only to find that this beautiful display had no RF input . . . and my Color Computer had no composite vid-

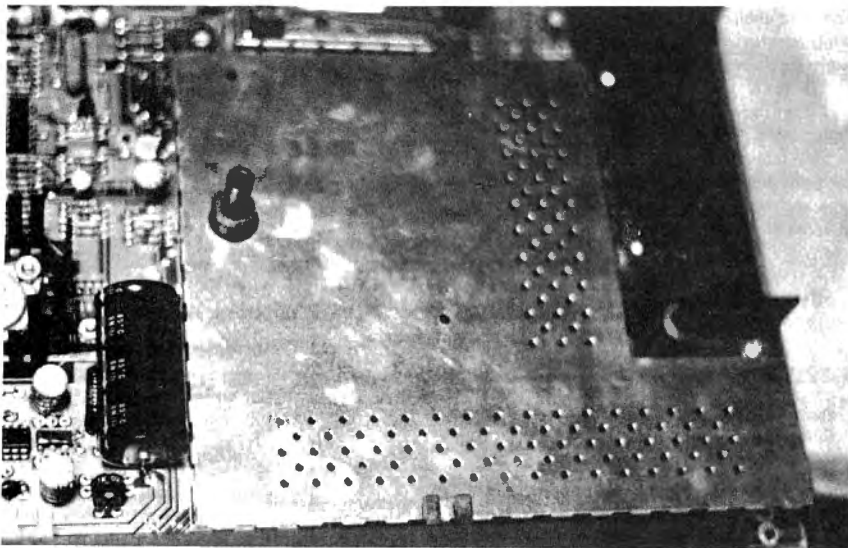


Photo 1. Main CPU activity is shielded by a metal cap, and by plate on the underside of the board, to prevent radio frequency interference (RFI) with televisions and radios.

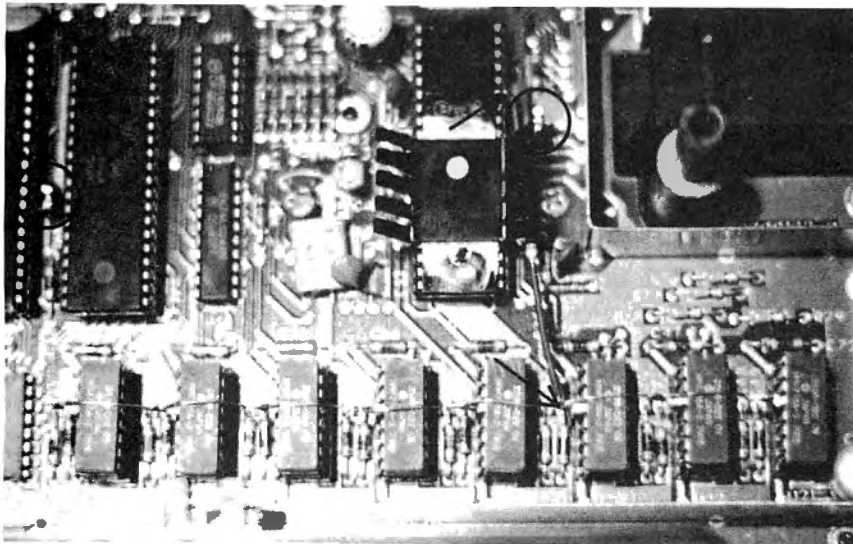


Photo 2. CPU area uncovered. Circles show 4K/16K jumpers, arrows point to 33-ohm resistor connecting SAM pin 35 to the second bank of memory.

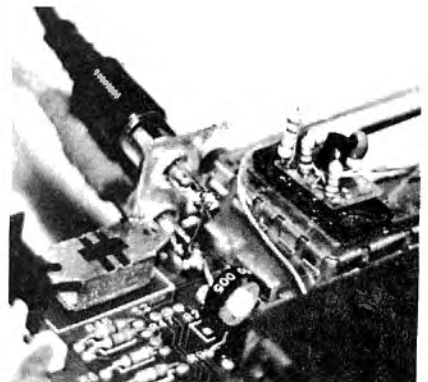


Photo 3. Video buffer amplifier affixed to the modulator unit. Dual phono jacks provide composite video output. Y-connectors can be used to drive ten or more monitors.

80 APPLICATIONS

eo output. It was back to black-and-white. Finally, I tossed together a short text editing program in Basic. I felt it would be more appropriate to write about the Color Computer while actually using it. A few minutes in front of a screen full of normal and reversed uppercase characters convinced me that real lowercase was the only way to go.

"A few minutes . . . convinced me that real lowercase was the only way to go."

Extended Color Basic

Reluctantly I filled out my waiver of warranty (see August Applications), paid \$99, and waited for my Extended Basic kit. The "kit" turned out to be an off-the-shelf Extended Color Basic manual and a single integrated circuit. When you order Extended Color Basic, be sure to ask for the kit; don't specify an "Extended Color Basic ROM," because that's all you'll get. At

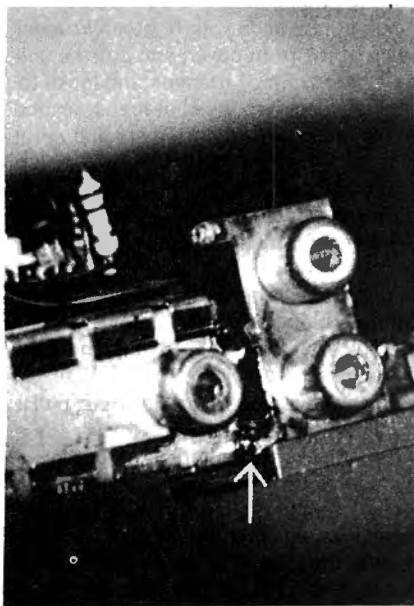


Photo 4. Arrow shows output jacks soldered to case of modulator unit (not the top). Two solder connections have been made for strength.

"I BOUGHT IT"

"My biggest loss of programming time using Snappware's AUTOMAP and AUTOFILE is spent inserting my diskette."

SCOTT ADAMS PRES. OF ADVENTURE INTL.



When working with direct files or creating a formatted screen, Autofile and Automap are indispensable aids.

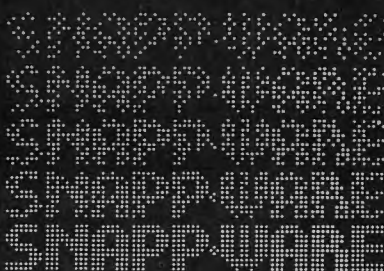
Autofile is designed to automate for the BASIC programmer the task of moving data elements to and from a direct file. Previously, this was a time consuming chore because the FIELDed variables may not be directly referenced by user logic. The FIELD statement was eliminated, thereby relieving you of the guessing game as to where the FIELDed variable is. In addition, the CHR\$ and the ASC function references are performed automatically. The software, when installed, becomes part of your BASIC interpreter providing the enhancements without additional memory or disk space.

Automap is designed to automate for the BASIC programmer the task of presenting information on the video display and accepting information from the keyboard operator. The software consists of two main components: the OFF-LINE COMPONENT used to describe to the system the screen formats and the ON-LINE COMPONENT from within your BASIC program to initialize a screen, send data to the video display and receive data from the keyboard operator. This facility when installed, becomes part of your BASIC interpreter providing the enhancements without requiring any additional memory or disk space.

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least with the kit they throw in a book.

When you receive the Extended Color Basic (ECB) ROM it will be packed in a plastic tube or on a piece of foam. Leave it

there until you install it. The device is static sensitive—not as frighteningly delicate as earlier integrated circuits, but still be cautious.

Before attempting to install ECB, you need a computer with 16K memory. If yours is 4K, then order a set of 16K memory chips. These should be type 4116, uPD416, or equivalent (generally advertised as TRS-80 compatible memory expansion). Expect to pay about \$18 a set of eight, but certainly no more than \$25. Purchase 200 to 250 nanosecond (nS) memories. These will permit you to operate your computer successfully at twice normal speed. High speed is a software action, by the way, put in effect by entering POKE 65495,0. A 4K machine will probably hang up. A 16K machine might lock up too. More later on how to do it.

The Installation

When you have your ECB chip and eight 16K RAMs at hand in their original packages—together with a Phillips screwdriver, a nailfile, and a 4-inch piece of aluminum foil—you can begin. First, open your computer and flip it over. There are nine visible screw holes, but (on the units I have seen) only seven are used. There is an additional hole under a label which warns, "Opening case will void warranty. See owner's manual for warranty information." Yes, you will void the warranty if you open the machine, so don't proceed unless you are willing to take the risk and save over \$100. When you open it you will find little to damage. Unlike the Model I, this machine is not delicate; it is physically sturdy and all sections are made to unplug, snap apart, or unscrew.

Unplug the machine, slowly flip the machine upright, slide your fingernails under the lip of the front cover, and pull the unit apart gently. Since it snaps and locks together, expect it to resist at first, then pop up; lift the cover up and back, and set it aside.

You will see: the keyboard, resting on posts and attached underneath with a removable cable; a circuit in a metal case at the very back; the cartridge connector at the right rear; and a large area covered by a metal shield (Photo 1). It is inside this shielded area that the ECB chip and RAM will be installed.

Lift the keyboard up off its posts, pull it forward about an inch, and look for some white plastic straps holding the metal shield in place; these may not be present. If they are, clip them off. Slowly work the metal cover up and off, examining how the shield is fitted in place so you can replace it later. Inside you will find several significant parts in large, 40-pin packages. Reading clockwise from the back right, these are: the 6809E central processing unit; below it a memory manager (Synchronous Address Multiplexer), type 6883; next, a

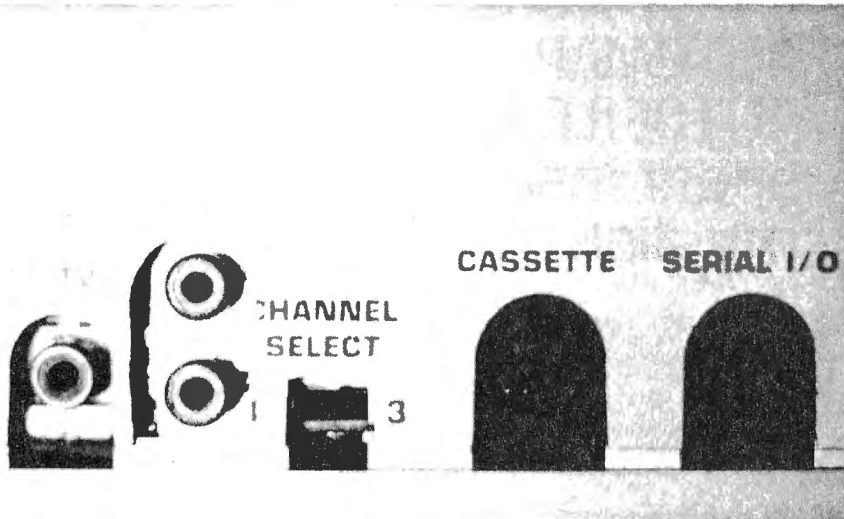


Photo 5. Video output jacks fit between television output and channel select switch. Carpentry should duplicate roughly the computer's style.

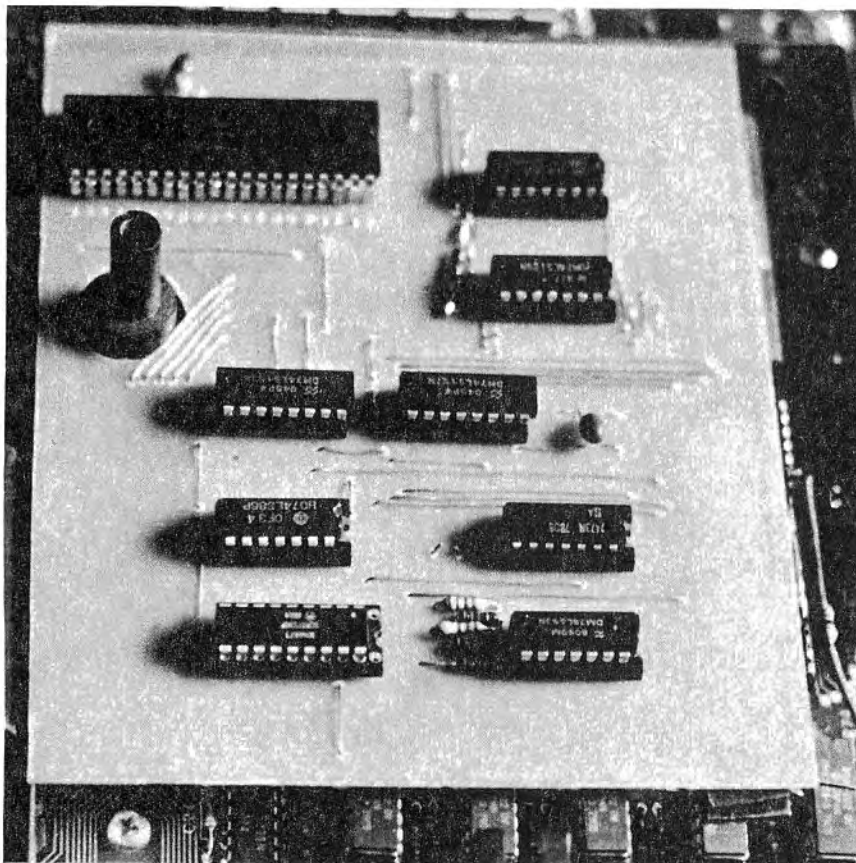


Photo 6. Complete lowercase board fits into VDG socket and around support port, and rest on banks of RAMs. When ICs are soldered to the board directly (they are socketed in this prototype), the RFI shield cover can be fit back in place.

80 APPLICATIONS

row of eight RAM chips; up from there, two 6821 port chips which handle keyboard, cassette, audio, and other input/output work; and a 6847 Video Display Generator. Note whether the 6847 is in a socket or soldered to the board; we will return to it later. Finally, there is an empty 28-pin socket, and to its right a socket containing Color Basic.

Referring to Photo 2, find the two small blue or black jumpers (one is to the right of the S.A.M. and the other is between the 6821s). Associated with each jumper are three pins in a row, and the jumpers that currently connect the middle pin to one marked 4K on the board. The other pin is unconnected. To begin the conversion to 16K, lift each jumper off and move it so it connects the middle pin to the 16K pin, leaving the 4K pin free. Now slip the nail file under each 4K RAM, rock it slowly from each end alternately, and lift it out of the socket. Place it, pins down, on the piece of aluminum foil.

Remove a 16K RAM from its package, holding it by the ends of the integrated circuit (not by the pins). Notice that one end has a notch, dot, or both. Orient it in the same direction as the other 4K RAMs (the notch pointed away from the keyboard) and carefully insert it in the socket. Be sure that no pins slip outside the socket or bend underneath the IC. Do this for each memory chip in turn. Double-check your work, make sure all your tools are out of the way, plug it in, and power up; you need not replace the cover for this test, but keep your hands out of the works.

The screen will clear, but the Color Basic sign-on message will take a little longer than normal to appear. Enter PRINT MEM, and you should discover bet-

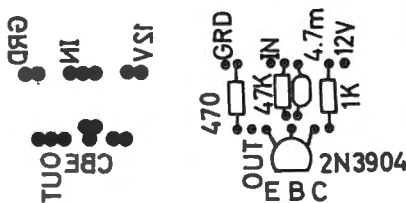


Fig. 1(a). Video buffer amplifier printed circuit layout, viewed from above through the board, and (b) parts mounting diagram, viewed from above.

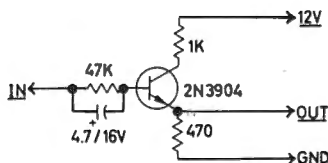


Fig. 2. Video buffer amplifier schematic.

“I BOUGHT IT” “My biggest loss of programming time using Snappware’s EXTENDED BASIC is spent inserting my diskette.”

SCOTT ADAMS - PRES. OF ADVENTURE INTL.

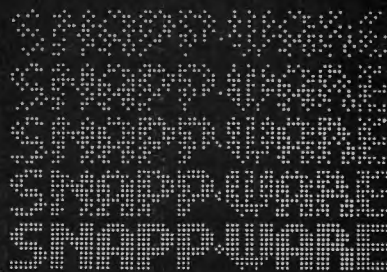


Reduce your programming time up to 75% using Snappware's EXTENDED BASIC. The program is written entirely in machine language for Super Fast execution and is fully integrated into the Model II BASIC interpreter, requiring no user memory and no user disk space. Here are just some of the ways EXTENDED BASIC can make your programming task easier:

- Quick way to recover BASIC program following a New, System or Accidental re-boot.
- Single character abbreviations for the most frequently used commands.
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- A powerful cross-reference facility with output to display and/or printer.
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ter than 14K available memory (the screen uses your regular memory, so this takes away from memory available for Basic use). Problems will show as a locked-up machine, only 4K of memory still reported, far under 14K memory reported, or random crashing. A locked-up machine indi-

cates RAM inserted backwards, pins crushed underneath or outside sockets, or (least likely) a bad memory chip. Recheck your work. If 4K memory is still reported after PRINT MEM, make sure the two jumpers are properly placed in the 16K position. Too little memory reported

might point to a bad memory chip; power up several times and see if this value changes, suspect a chip which is too slow (be sure to get 200 nS RAMs). Finally, if the system randomly crashes, you probably have a RAM which is not fully inserted in the socket; check again.

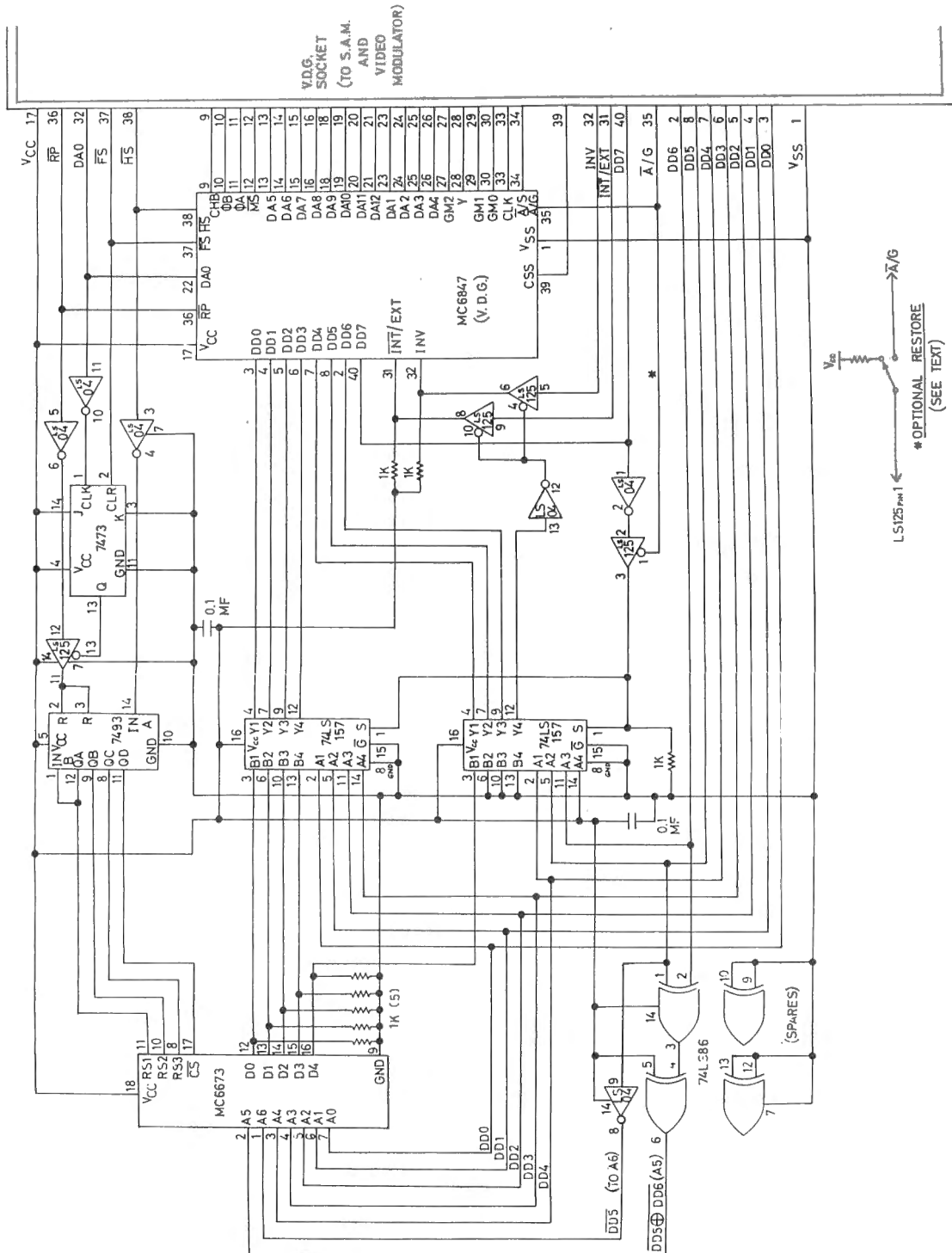


Fig. 4. Schematic of the lowercase modification for the Color Computer.

If all is well, remove the line cord. This is important, because the power supply transformer inside the case is always "hot." Insert the ECB ROM chip in the empty socket next to the Color Basic ROM. Position it carefully, with the notch in the same direction as that of the Color Basic ROM. Press it into the socket, being sure not to bend any pins underneath or letting any slip outside the socket. You have just performed Radio Shack's \$20 installation.

Plug in and power up the computer. Your screen will now display an Extended Color Basic copyright notice. PRINT MEM will report 8487. 8487 on a 16K machine? Yes, because initially ECB sets aside 6K of memory for high resolution use. PMODE0:PCLEAR1 <ENTER> will give you about 14K of usable RAM.

Now power down, unplug the machine, and look over your work. Replace the metal cover. This is important because it prevents your television or radio from picking up interference from the computer. Place the keyboard back on its pegs, replace the cover and re-insert the screws. Your 16K ECB computer is complete. Wrap up the package of 4K RAMs in the aluminum foil; you may be able to trade or sell them someday.

About High Speed

As I mentioned, the Color Computer has a built-in high-speed mode, accessible by POKEing 65495 with any value. POKE 65494,0 will return to normal speed. With 200 to 250 nS memories, your computer should be able to run at high speed, which will be evident if the cursor flashing rate increases. The hangup is the pair of 6821 port chips which handle keyboard scan, cassette I/O, certain aspects of video, etc. These are rated for 1 MHz operation (the Color Computer normally operates at 0.9 MHz), and occasionally won't do the job at 1.8 MHz. Try it and see; if you are sure you'll need the higher speed in the future, then opt for replacing the 6821s with type 68A21, a faster device.

32K RAM for the Adventurous

Little effort is required to add another 16K of memory. Some solder, and iron, needle-nose pliers, wire snips, one 33-ohm resistor, a few inches of light solid wire, nine pieces of wire insulation, three feet of aluminum foil, and another 16K RAM set are all that is necessary. You also must have time, patience, dexterity and perhaps a magnifying lens, but the process is not formidable.

In short, you will fit each memory IC atop those already in the computer, and solder it there. One pin will be connect-

"I BOUGHT IT"

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- PEEK-** Extract one Byte from a specified memory location.
- PEEKW-** Extract TWO Bytes from a specified memory location
- POKE-** Replace contents of a specified memory location with a supplied value
- POKEW-** Replace contents of a specified memory WORD with the supplied value
- XDAT-** Extract current date in format
- XTIM-** Return time of day to format
- ETIM-** The difference between two times
- FILES-** Return the number of file blocks currently allocated
- SRT-** Sort one or more arrays into a specified sequence
- OPEN-** Open a sequential file in extended mode
- ROW-** Protect a portion of the video display from scrolling
- CLEAR-** Specify the number of file blocks to be allocated when you specify high memory and string space
- ERASE-** Erase all arrays
- CURSOR-** Specify size and display format of cursor
- MAX-** Return largest value from user supplied list
- MIN-** Return smallest value from user supplied list
- FMT-** Arrange data into a string variable as with PRINT USING

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ed not to the RAMs below, but together with the other RAMs in the new set. A resistor will run from the SAM chip to this connection in order to select the second 16K block of memory.

For safety, line your worktable or desktop with aluminum foil, and set your tools, parts, and computer on it. Ideally, use a non-static felt workstation (#WS-9010, sold for about \$15 plus shipping by Wes-corp, 1155 Terra Bella Avenue, Mountain View, CA 94043), which includes a grounding wrist strap. Open the computer case according to directions above, and put the top and metal shield aside. For reference, locate the eight memory chips (socketed, nearest the keyboard), and the Synchronous Address Multiplexer (SAM, the 40-pin chip U10 just above and to the right

of the memories).

Examine your new set of 16K RAMs. If they have gold pins, they should fit in place as is. Otherwise, you will see that the pins fan out slightly from the body. Keeping your arm grounded against the aluminum foil, hold the sides of the IC between thumb and forefinger, and squeeze until the pins are perpendicular to the body or canted very slightly inward. Keep the pins in line with each other. Orienting the notch in the proper direction, temporarily fit one of these RAMs atop one of those in the computer. Make sure the pins line up precisely with those already in place, that they fit snugly, and that no pins slip in between others. Form each memory chip this way.

Identify pin 4 of the new memory chips.

Looking at the top of the chip with the notch facing away from you, this is the fourth pin down from the upper left. With the needle-nose pliers, bend this pin gently (not sharply) out and upward so it rises above the top of the IC. Do this for each of the eight chips.

There are three ways to continue with this project, depending on your soldering technique.

- First method: Fit all eight memory chips into place. Check that in bending pin 4 you have not altered any other pins. With a small, hot soldering iron, flow a minimal amount of solder on pins 1, 8 and 9. It should join the new chip with the one below it; be careful not to melt the socket or create globs of solder.

- Second method: Fit all eight memory chips in place. With a small, hot soldering iron, flow a minimal amount of solder on all pins (except pin 4, which is pointing upward). Solder alternate pins as you work your way around the chip; allow time for it to cool if it feels uncomfortable to the touch. Be very careful not to melt the socket or create solder shorts or globs.

- Third method: Remove the eight memory chips from the sockets, piggy-back the new chips on these, and solder them pin-for-pin (except pin 4) on the workbench. Since they are out of their sockets, you will have to be doubly careful not to overheat them. Then re-insert the piggy-back pairs in the sockets, orienting them correctly.

A wire must be connected to all the pin 4's. The easiest way is to snip off a piece of bare wire long enough to connect all the pins together in a line. Solder this wire to the first memory chip to the left, then slip a piece of insulation on the wire. This piece should be long enough to cover the wire only as far as the next chip. Solder the wire to the next pin 4, slip on another piece of insulation, then move on to the next. One exception: between the fifth and sixth memory chips (U23 and U20), leave a little extra wire and put two shorter pieces of insulation in place.

You will now use the 33-ohm resistor. Slip a piece of insulation over each end so about 1/8 inch of bare wire is visible. Solder one end to the point in the middle of the two pieces of insulation between the fifth and sixth memory chips. Locate the SAM chip (U10); identify pin 40 (the top right-hand pin), and count backward until you get to pin 35. The other end of the resistor will comfortably reach this pin. Using a very small amount of solder, attach the other end of the resistor here.

Refer to Photo 2 for details on this mod-

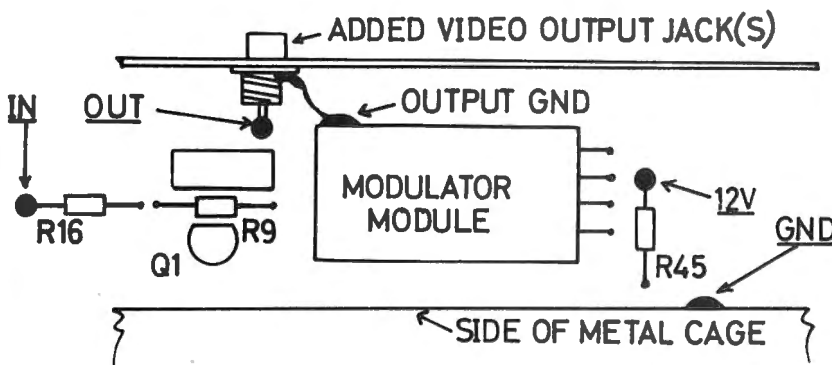


Fig. 3. Four wires connect the video buffer amplifier to main PC board at R16 (output to amp), R45 (12-volt power supply), metal cage wall (ground), and phono jack center pin (video output).

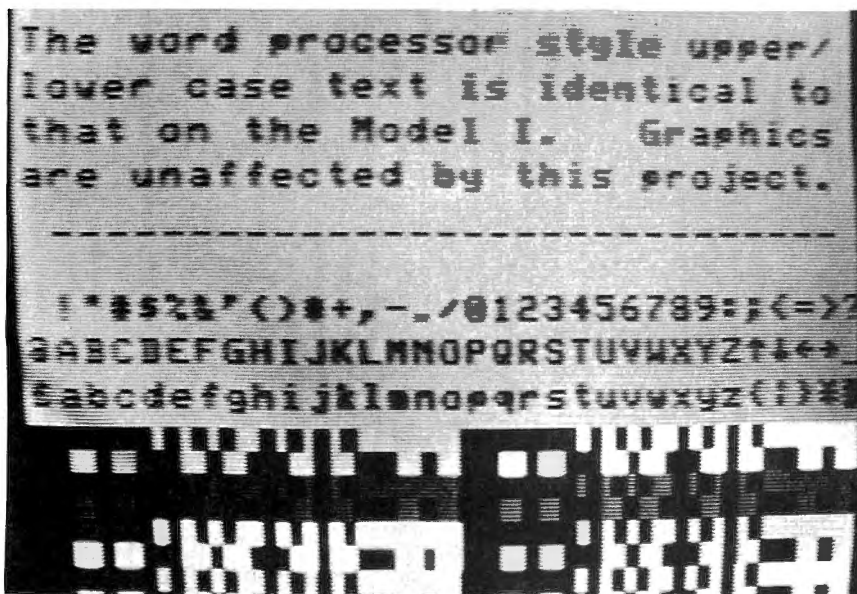


Photo 7. Latest character generator used for the Model I TRS-80 produces 5-by-7 dot matrix characters with descenders.

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ification. The arrows show connection points for the 33-ohm resistor. Cavalierly I have left off the insulation on my connection wire; don't do that, because the RF shield cover can short against the wire. The additional bank of 16K memory is now ready to use. Plug in and power up the computer. The sign-on message should take a while to appear; when it does, enter PRINT MEM. Over 24K of memory should be revealed, the rest (as I mentioned above) being reserved for high-resolution graphics.

Problems and Causes

Problems? They may include: a locked-up machine with no sign-on message; random crashing and lockup after the sign-on message; no evidence of the second 16K bank of memory; an improper amount of memory display upon PRINT MEM.

Probable causes: A locked-up machine points to memory inserted backwards, shorts between pins, memory lifted out of its socket, or memory damaged by heat (the last is unlikely but possible). Solder globs or hairs on the SAM chip will also

cause this. Random crashing after sign-on probably results from pins not seated properly on the memory chips below, not fully bent, corroded, or otherwise not making proper contact. No evidence of the second 16K memory bank is caused by one pin not making any contact at all with the one below, or a bad solder connection on the 33-ohm resistor. An improper amount of memory may be caused by a bad or slow memory chip, or, if the displayed amount of memory changes, by an improperly seated or soldered chip. Replace the RF shield and computer cover. The 32K memory modification is now complete.

By the way, here's the theory of what you have done. All the memory lines (address, data input, data output, refresh/select, and power) are identical but one. Therefore, the second set can be paralleled (piggybacked here) on the first set. Pin 4 is the only exception, and it is the memory address line MA7. Pin 35 of the SAM chip provides this signal whenever a memory address from 4000 to 7FFF (decimal 16384 to 32767) is requested.

Sinking SAM

Look again at Photo 2. Something is attached to the top of the SAM chip, with a white substance smeared on it. After your computer has been operating for a while, place your finger on the SAM chip; if it is uncomfortably hot, you may want to extend its life with a heat sink. Only two machines I have seen (felt?) have this heat buildup in the SAM, so you may not need this mod.

Obtain a finned, black, TO-220 heat sink and flatten the fins somewhat. With white silicone heat-sink grease, cover the top of the SAM and the bottom of the heat sink. Press it in place, fins up; the grease will hold it there. Replace the metal RF shield. It should just touch the heat sink if you have bent the fins properly.

Sweetening the Video

The television (RF) output of the Color Computer is excellent, and if you have no access to a color monitor, it gives a fine video image. But there is a purity in coupling video directly to a monitor without

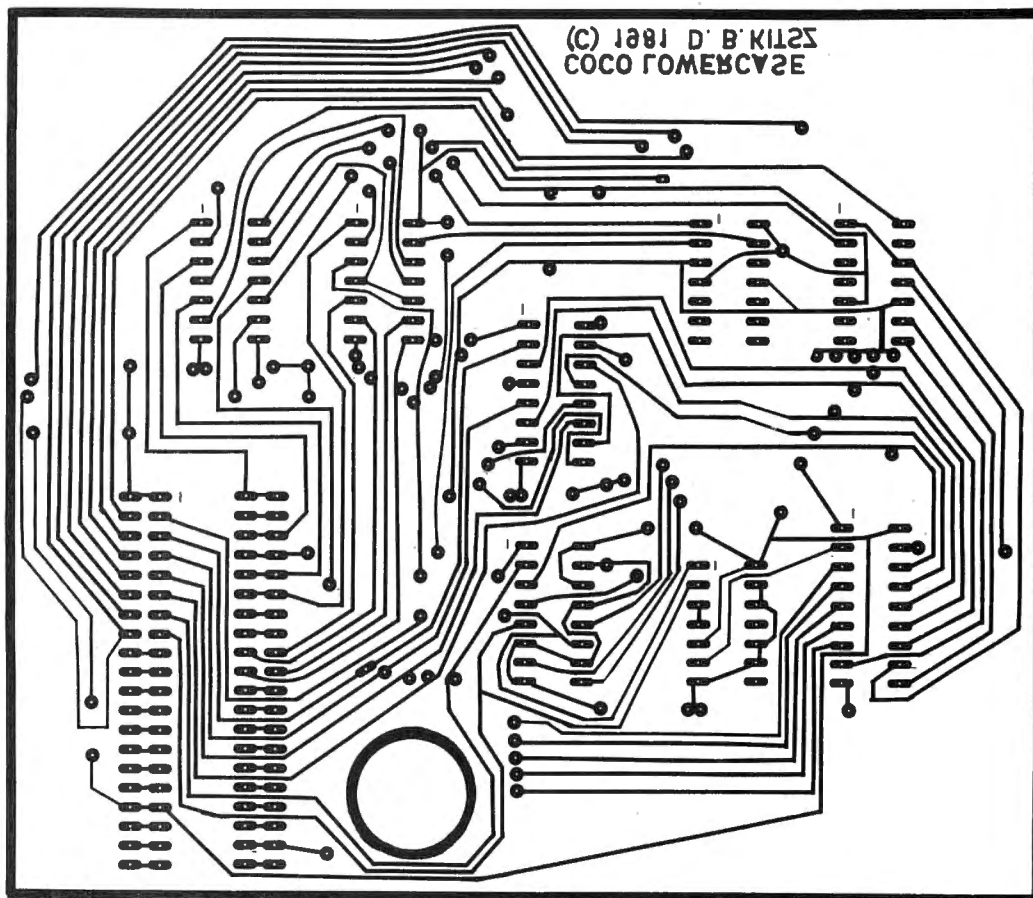


Fig. 5. Complete printed circuit board layout for the Color Computer lowercase modification. Post hole must be cut before mounting parts on the board. Note that this is the bottom of the PC board, viewed from above and through the board.

80 APPLICATIONS

converting to RF and back again at the television. Further, the signal sent out by the Color Computer is too weak to power a number of sets for display purposes or group use, but the video buffer/amplifier shown here can run a dozen sets or more. High-resolution graphics are more finely detailed, particularly on black-and-white sets.

A printed circuit board layout for a 3/4-inch-square board that affixes to the video modulator case with double-face tape is shown in Fig. 1. The schematic for a simple transistor buffer/amplifier which attaches ahead of the RF modulator and provides a clean, fast, composite video output is shown in Fig. 2. The unit can be assembled on perfboard as well; be sure to keep leads short. Radio Shack sells 2N3904 transistors (276-2016, or in packs of 15, 276-1603), and the resistors. A common electrolytic capacitor may be used (Shack number 272-1024), though I use a bead tantalum type for cleaner signal (no lead available from Radio Shack).

For video output, I installed a pair of ordinary phono jacks similar to those used

for the computer's TV output. Solder can be flowed directly to the modulator's case to ground these jacks, but don't solder the cover in place (in case video alignment is needed at some future date). All that remains is the carpentry. The plastic case is soft, so it can be cut easily with a fine coping saw blade and filed smooth. Photos 3, 4 and 5 show the results of mounting the video buffer/amplifier, fastening the jacks, and cutting the case. The locations where the four leads from the video buffer/amplifier must be soldered (input, output, 12-volt supply, and ground), are identified in Fig. 3.

If you have a parts "junk box", this is a free project; otherwise, the investment is about \$2. If you have no time at all, a complete kit of parts is available from MSB Electronics (see the end of this article for details).

Real Lowercase

If the Color Computer has any truly serious deficiency, it is the lack of reasonable lowercase letters. For programming and prompting, that lack is not too bad;

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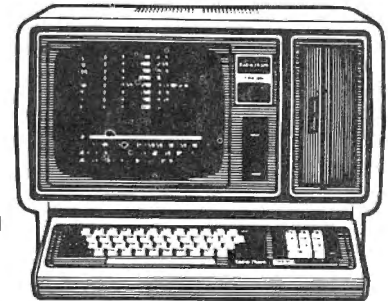
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but for text editing of any kind, a screen full of black letters and green letters in black blocks is not merely inconvenient, it is ridiculous. You can provide legitimate lowercase with the Color Computer, though by no means as easily as on the Model I.

On the Model I, the lack of lowercase characters was merely a result of the absence of one bit of video storage. By adding that bit, lowercase characters already present in the Model I's character generator became available to the user. The Color Computer uses a vitally different method of accessing characters: the 6847 Video Display Generator (VDG).

Within this integrated circuit the characters are created, and both coarse and high-resolution graphics modes are produced. Together with the SAM chip, flicker-free displays of alphanumerics and graphics are possible. The VDG contains an internal 64-character generator, and no lowercase letters. To simulate them on the Color Computer display, inverted characters are selected when bit 6 goes low. Software converts the internal character

set (00 to 1F) to correct ASCII equivalents with green letters on black for lowercase (60 to 7F), and the inverted character set (20 to 3F) to correct ASCII equivalents with black letters on green for uppercase (40 to 5F). The numbers and symbols from the black-on-white set are not printed. If this sounds a little confusing, it is. Enter this short program:

```

10 CLS:PRINT:PRINT:PRINT:PRINT
20 PRINT:PRINT:PRINT:PRINT
30 FOR X=1024 TO 1151
40 POKE X,Y:Y=Y+1:NEXT
50 FOR X=0 TO 127
60 PRINT CHR$(X):NEXT
70 GOTO 70

```

The top four lines in the first group show the character set actually received by the processor; the second group of lines presents the character set converted to normal ASCII by the Basic screen display routines.

When bit 7 is set high (hex 80 to FF), the semigraphics mode is selected, allowing eight groups of graphics characters to be displayed. These graphics blocks are

identical in both displays above since standard ASCII values are not assigned to these codes.

Table 1 describes the 6847 display generator and the functions of each of the pins, and how the VDG fits into the Color Computer system. Each input or output used for the modification will be described later.

The key to displaying an independent set of characters is the INT*/EXT connection (pin 31). According to the Motorola data sheet, this mode "uses an external character generator as well as a row counter. Thus, custom character fonts and graphic symbol sets with up to 256 different 8x12 dot 'characters' may be displayed." To display lowercase on the Color Computer, then, the VDG must be fed information by some external device (such as the Model I character generator); a row counter must be added to select the lines of dots to be displayed on the screen; and all other modes of graphics must be maintained unchanged for compatibility with normal Color Computer operations. Ideally, the whole thing

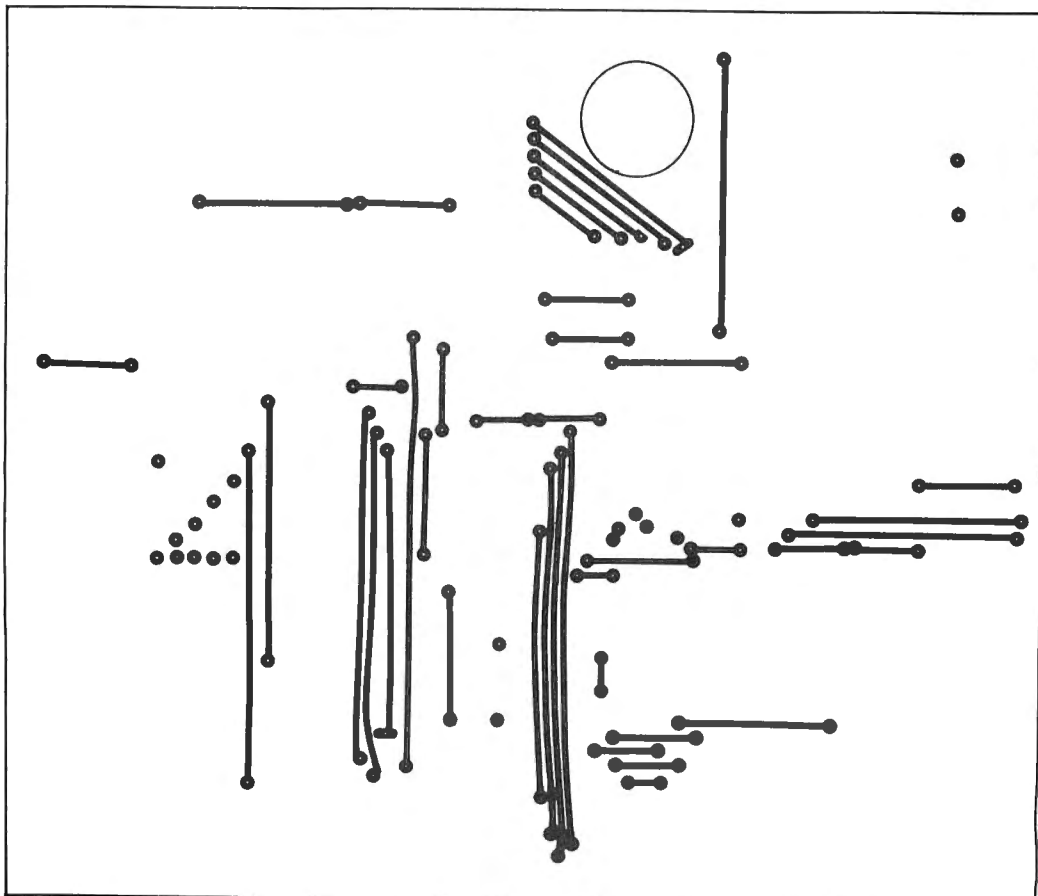


Fig. 6. Jumper arrangement for lowercase board, viewed from above. Jumpers should be soldered in place before the integrated circuits are mounted. Note that this figure will produce a double-sided PC board.

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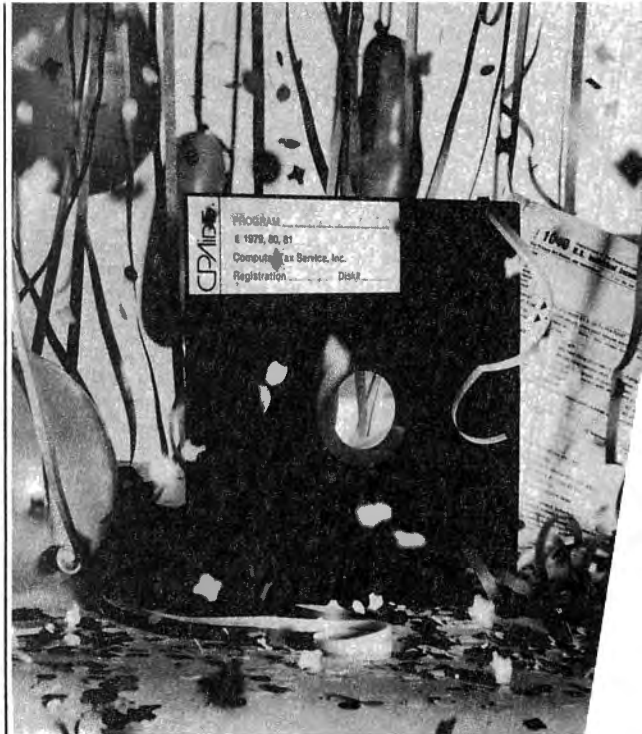
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should be switch-selectable.

The complete schematic for a lowercase addition is shown in Fig. 4. The VDG is intercepted and connected to several outboard integrated circuits. The heart of the external selection process is the pair of 74LS157 multiplexers in the center of the diagram. A multiplexer is like a traffic light—only one pattern of vehicles may proceed at a time. In this case, eight lines of data are switched from the internal mode (the multiplexer A inputs) to the external character generator (the B inputs). In charge of this selection process is data bit 7 (DD7, pin 40) together with the alphanumeric/graphic select line (A*/G, pin 35). When alphanumeric mode is selected, the signal from DD7 (inverted by the 74LS04) passes through the 74LS125 buffer. If DD7 is high, semigraphics are selected (coarse graphics with hex codes 80 to FF), which

causes the multiplexers to connect their A inputs to the Y outputs. By following data lines DD0 through DD6 from the socket, you can see that these seven signals will pass through the multiplexer directly to the VDG. The eight A input is tied high, and passes through an inverter. This eight signal opens up the other 74LS125 buffers to the INV signal (pin 32) and the INT*/EXT signal (pin 31). In other words, when semigraphics are selected, all signals proceed normally to the VDG, as if there were no other circuitry in place. When high-resolution graphics are selected (A*/G is high), the result is the same—completely normal operation of the computer.

When line DD7 goes low (meaning alphanumerics are being printed on the screen), the B inputs of the multiplexers are connected through the Y outputs to the VDG. Five dots are output from char-

acter generator lines D0 to D4, as selected by the address inputs A0 to A6. The computer's video display is made up of 12 rows of dots per screen line. Because the character generator must know which set of dots to output for each line, a counter is needed which counts from 1 to 12 in binary to select these dot rows. Since the Model I character generator is only a 5 × 7 matrix of dots, however, this chip must be deselected (turned off) during the final counting stage.

Count Sheep Instead

All of this counting is done by the combination of a 7493 binary counter and a 7473 flip-flop. The 7493 counter is configured to count from one to 16. Display scan lines are selected by sending a clock signal provided by the horizontal synchronization (HS*) pulse, and the count is reset to zero (cleared) by the row preset (RP*) pulse, where it begins counting again. This produces a complete row of characters. Counting stops completely when the video beam is out of the frame by the field sync (FS*) signal, and counting begins again when the first character is fetched from memory (DA0). In fact, this counter only counts to 12 before it is cleared for the next screen line. Since this character generator produces a 5 × 7 matrix, the chip must be turned off to avoid redisplaying the first five lines of any letter immediately below it. The generator is turned off by bringing the chip select line (CS*) high; a count from 8 to 12 brings the QD output of the 7493 high—perfect for deselecting the character generator at that point. The five resistors hold the character generator's data outputs low during the deselection phase, and assure that the characters will be presented on a clean screen, and not one filled by characters underscored with black rectangles.

The final difficulty is the conversion process accomplished by the software. As noted earlier, since the internal character generator uses only six bits of data, these characters fall outside the normal ASCII positions. They are input to the CPU which then performs a software change to make them compatible with usual ASCII codes. The Model I character generator, however, provides proper ASCII codes. To make the character generator look like the VDG, then, the lowercase must be swapped with control characters, numbers must be swapped with lowercase, and uppercase remains the same. The 74LS86 XOR gate configured as an exclusive-NOR gate correctly swaps signals that enter address line 5; DD5 is inverted and presented to address line 6. This conversion (see Table 2) provides the

Signal Name	Pin Number	Description of Function
Vcc	17	Power supply voltage, +5v.
Vss	1	Power supply ground.
CLK	33	Color burst clock input, 3.58 MHz, provided by the SAM chip.
DA0-DA12	22-26, 13-16, 18-21	Address lines to display video memory, set to high impedance during MS*. These address lines are not used in the Color Computer since the SAM chip provides the characters as needed.
DD0-DD5	3-8	Data from display memory, provided by the SAM chip.
DD6	2	Data from display memory in graphic mode, color data in semigraphic mode. Tied to the INV line in the Color Computer. Information is provided by the SAM chip.
DD7	40	Data from display memory in graphic mode, color data in semigraphic mode. Provided by SAM.
phase A	11	Chrominance and luminance analog outputs to video modulator chip
phase B	10	Chrominance and luminance analog outputs to video modulator chip
Y	28	MC1372, and chroma bias reference to phase A and phase B levels.
CHB	9	Chrominance and luminance analog outputs to video modulator chip
RP*	36	Row preset timing output for an external character generator. Not used in the Color Computer.
HS*	38	Horizontal sync timing output for an external character generator, and used by the SAM chip for memory timing.
INV	32	Inverts video in alphanumeric mode. Normally in invert position for uppercase letters in the Color Computer, and tied to DD6.
INT*/EXT	31	Switches to external character generator in alpha mode and between semigraphics modes 4 and 6. Handled by SAM.
A*/S	34	Switches between alphanumeric and semigraphics modes. Handled by SAM.
MS*	12	Memory select line Input disables address buffers. Not used in the Color Computer.
A*/G	35	Switches between alpha/semigraphic modes and medium/high-resolution display modes.
FS*	37	Field synchronization output goes low at bottom of display area, and returns high at top of video display. Not used in the Color Computer.
CSS	39	Color set select chooses colors for alpha display in semigraphics 6 and full graphics mode.
GM0-GM2	30,29,27	Select for one of eight graphics modes. Color Computer software does not access them all, although the hardware makes them available.

Table 1. 6847 Video Display Generator pin assignment in the Radio Shack Color Computer.

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Most Level II string functions are supported: INSTR, STR\$, VAL, CHR\$, ASC, LEFT\$, RIGHT\$, MID\$, INKEY\$. Complex string formulae are not allowed (thus you can't say A\$=LEFT\$(X\$+Y\$,2); you would need to say something like B\$=X\$+Y\$:A\$=LEFT\$(B\$,2), instead.

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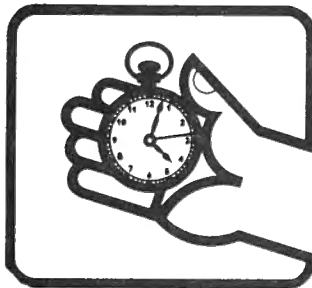
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✓ 39

to your local newspaper or printing office and obtain an exact-size (100%) film negative. Clamp the negative firmly against a piece of negative photosensitive PC board (from Kepro or Vector) in a photo proof-sheet frame, under a vacuum table, or just under glass weighted all around so there is no space between the negative and the PC board. The words "Coco Lowercase" should read correctly.

You may make your own board with negative PC photosensitizer. Work only under darkroom lighting or on the other side of the room from a shaded, dlm, yellow bug light. Expose the board with a 3200 degree tungsten photoflood bulb (available at any photo store) at a distance of two feet for seven to ten minutes. Develop the board for one to two minutes in PC board developer (Kepro or Vector), and harden the emulsion in an oven at 200 degrees for about one half hour or by drying overnight. Drop the board into a glass or enamel tray of ferric chloride, face up, and gently agitate about a half hour until all the copper has been removed except where the traces are present. Wash the board thoroughly, dry it, and drill all the holes with a #66 hobby drill; this is most easily done in a small drill press. Cut the post hole to the outside edge of the copper band. Remove the remaining emulsion with steel wool, buffing until the copper is very shiny. Wipe the board clean with a dry cloth, and begin mounting the parts.

Mount the jumpers first; there are 42 of them. Put the resistors and capacitors in

place next. Then mount the integrated circuits. If you use sockets, the RF shield will need extra help to remain in place.

The final few steps are a bit tricky. Insert a 40-pin wire-wrap socket three-quarters of the way into the board; refer to the parts layout (Fig. 7) to be sure you put it into the correct set of 40 parallel holes. Solder all 40 pins into place so that about 1/2 inch of wire wrap pin protrudes from the bottom of the board. Now clip the socket off, snipping close to the top of the board. Pull all the pins out of the socket, and slip the socket over the pins which are soldered to the board. It becomes a 40-hole grommet, helping the pins stay straight and guiding them for insertion in the VDG socket.

A 40-pin, solder-tail socket is inserted in the remaining holes on the board. It should fit easily in place; if its pins do not protrude through the board, double check that you have clipped the tops of the wire wrap pins closely.

Open the computer and remove the metal RF shield. Find the VDG, a 6847 chip mounted at the back left of the metal cage. Now remove the VDG from its socket. Lift it very gently with a nail file, rocking the file from side to side. If the chip moves a little and then sticks, push it back down and start again. Gradually it will work free. Insert it in the 40-pin socket on the new PC board. The wire wrap socket pins are positioned over the VDG socket and the post goes through the hole in the board. Shine a bright light through the hole, and look

through. Fit the wire-wrap pins into the VDG socket, and press gently but firmly until it secures in place. The modification is now complete.

If you read this last paragraph with consternation, it probably means that your VDG is soldered in place. The first three of four thousand Color Computers were produced this way, mine among them. Unsoldering the VDG and inserting a socket is an unmitigated pain, demanding patience and over an hour. You will need—and don't do this without—solder wick or other flux-impregnated solder-removing braid, and fine solder. *Do not* attempt to remove this circuit unless you have the proper materials ready and are willing to take the time to do it correctly; the process cannot be rushed.

Make sure the line cord is unplugged, then pull off the power supply connectors from the main board and from the power cord. Mark down their positions as you do this. Remove the screws holding the power supply in place (two are recessed into the board against the power transformer). Lift out and set aside the power supply.

Unplug the keyboard from either the computer or keyboard end, and set it aside. Remove the screws from the PC board (there are a dozen), and lift the entire board out of the case. Easy so far. The bottom of the PC board is completely covered with a metal plate, but this removes easily. It is held in place by nifty little expansion rivets. Push on each one, very gently but firmly, with the eraser end of a pencil until it works out of the board. Eventually the metal shield will fall free.

Lay the solder wick on the VDG pins on the underside of the board, and heat it and the pins with a soldering iron until the solder flows off the VDG pins into the solder braid. Check the temperature of the VDG as you work, and stop to let the IC cool off completely if it gets uncomfortable to the touch. Its pins are rated 325 degrees for 10 seconds, so don't exceed that. Eventually there will be very little solder remaining, most of it having been sucked out of the PC board holes into the braid. Test each VDG pin from the bottom with your fingernail to see if it is free from the hole; a slight push should snap it away from the hole wall. Otherwise, desolder a bit more.

When the chip is finally free, lift it out and set it aside on some aluminum foil or black protective foam. Clean the solder flux off the board with 3M belt cleaner #78-9020-0006-2. Insert a 40-pin socket and solder hairs, balls, or shorts. Push the plate back on the PC board, pressing each rivet back in place. Replace the board in the case, screw it down, reinstall the key-

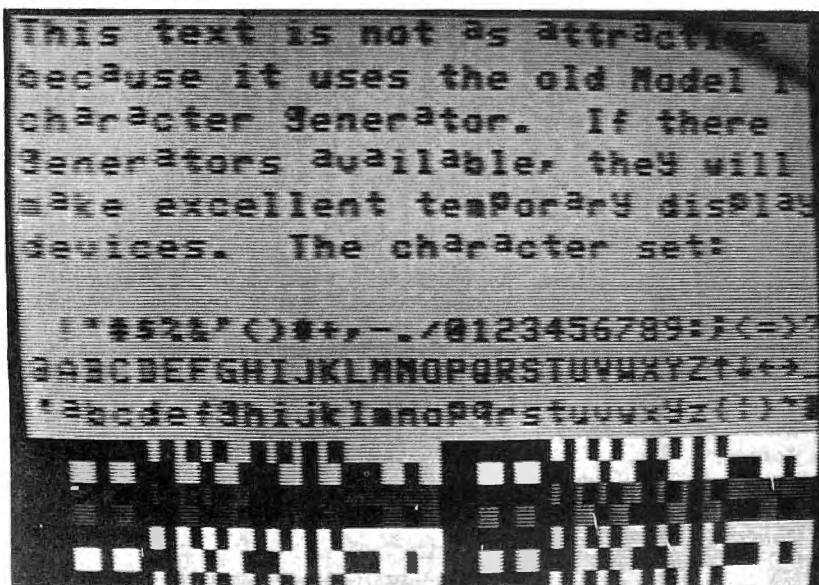


Photo 8. Older Model I character generator produces text more acceptable than the color machine's inverted system, but does not have descenders. Text shown in this photo has peculiar grammar.

board and power supply, and power up. All should be well. Breathe deeply.

Lowercase at Last

Now the test. Double check for correct insertion of all integrated circuits, jumpers, resistors, and the VDG itself. Also recheck the wire-wrap extender pins, making sure they fit into the socket exactly. The finished installation should look like Photo 7. Now restore power to the Color Computer. If you have set the switch in the new generator's position, or if you chose not to install the switch option, your sign-on message should appear. It will look mostly the same, except that the O's are no longer square and the zeros are slashed. The top row of letters will also touch the top border of the screen. Enter this program:

```
10 CLS
20 FOR X=0 TO 255
30 PRINT CHR$(X);
40 NEXT
```

The screen will clear and all your printable characters will appear, including real lowercase letters with descenders, as in Photo 8. If you have the old Model I character generator, the character set will look instead like Photo 9.

If you have installed the switched option, flip back to the original mode. The reversed uppercase characters reappear in the place of the lowercase ones. To demonstrate the difference dramatically, leave the old system switched in, and enter this program:

```
10 CLS
20 AS=INKEYS
30 PRINT$CHR$(95)CHR$(8);
40 GOTO 20
```

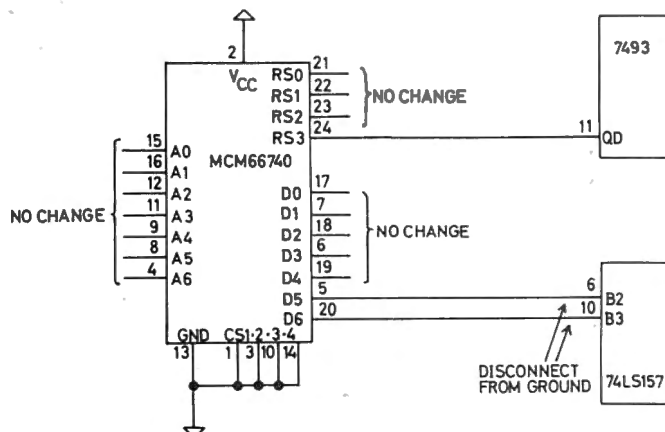


Fig. 8. Schematic changes for using the MCM66740 (or other members of the MCM66700 family) character generator, providing a 7-by-9 dot matrix.

This is a simpleminded text display. Begin typing, using shift-0 to produce lowercase (reversed) letters. Punctuation and uppercase are normal. Fill the screen with text until it is a blotchy mess. Now flip the switch to engage the new lowercase generator. What a good feeling.

Problems? If you have a black, jittery screen with unidentifiable characters, check to see that the VDG is seated properly in its socket, and that the external generator board is pressed firmly into the PC board socket. Also check for cold (improper) solder joints on the board, or broken, cracked or scratched PC traces. If the screen displays the wrong characters (mixing lowercase with uppercase, numbers or control characters), check the soldering on the 74LS86 or the 74LS04. If there is no display, see that the external generator board is pressed into the Color Computer socket correctly, and that the pins are not offset by one position to the right. If alphanumeric and graphics are mixed oddly, make sure that the 74LS04 and 74LS125 are inserted in the correct direction. If the screen is a garbled mess, look closely at pin 33 of the VDG, checking for solder hairs or shorts. For any other problems, recheck all of your work.

Where to Get Parts

A complete kit of parts for the video buffer/amplifier is available for \$7.50 post-paid from MSB Electronics, Drawer 766, Barre, VT 05641. The lowercase modification board is available complete and ready to install for \$89.95 (7 x 9 matrix).

Printed circuit board supplies are sold by Vector Electronic Company, 12460 Gladstone Avenue, Sylmar, CA 91342 or Kepro Circuit Systems, 630 Axminister Drive, Senton, MO 63026

Integrated circuits and transistors for these projects are commonly available;

see the classifieds in computer and electronics publications. The 5x7 Model I character generator is part number AXX3027 (type SCM37530P/8046673), from Radio Shack, also known as the word processor generator; the price varies. The 7x9 character generator is sold by Jade Computer Products, 4901 West Rosecrans Ave., Hawthorne, CA 90250, part number ICP-MCM66740P, \$13.25.

For removing soldering flux, 3M Belt Cleaner (part number 78-9020-0006-2) is sold by 3M, Visual Products Division, St. Paul, MN 55144. Eight-ounce samples (enough to last years) can be obtained at no charge from service representatives.

Updates

- I continue to get mail asking about the Memory Sidecar (February Applications). It is available complete or as a PC board from the Peripheral People, P.O. Box 524, Mercer Island, WA 98040. Write for information.

- Thanks to the readers who sent in new and innovative solutions to the Game of Life, using Hooper's algorithm. I will be presenting some of those intriguing solutions from time to time in the future.

- My sincere apologies to any readers who waited to receive a copy of my book, *The Custom TRS-80*. Due to a 3,000-mile hassle over editorial control, the book was inexcusably delayed.

- Corrections to high-resolution graphics board (The Detailer, July Applications):

1. In Fig. 1, Z8b is shown as a three-input NAND gate. It is a three-input AND gate, type 74LS11.
2. Pin numbers were omitted from Z32. Z32A, inputs 1-2, output 3. Z32B, inputs 4-5, output 6. Z32C, inputs 9-10, output 8. Z32D, inputs 12-13, output 11.
3. Pin numbers were omitted from Z33. Z33A, inputs 2-3, output 1. Z33B, inputs 5-6, output 4.
4. The TRS-80 SYNC connection was omitted. It is found at Z32 pin 11 in the TRS-80.
5. The 10 mF 16V capacitor connected

INTERNAL	[\] ↑ ← □ □ □ □ □ □ □ □
EXTERNAL	↑ ↓ ← → _ £ { } ~ ✻
OLD VERSION	↑ ↓ ← → _ _ { } ~ ✻
ASCII VALUE	5B 5C 5D 5E 5F 60 7B 7C 7D 7E 7F

Fig. 9. Comparison of internal VDG character set with Model I character generators. The earliest generator also differs in that the lowercase letter "a" is above the baseline.

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80 APPLICATIONS

- to Z33A should be labeled C8.
- In Fig. 2, pin numbers were omitted from Z31. Z31A, inputs 1-2, output 3. Z31B, inputs 4-5, output 6. Z31C, inputs 9-10, output 8.
 - In Fig. 4 and the parts list, the values of C6 and C7 are omitted. They are 750 pF and .022 mF, respectively.
 - The values for VCR1 and VCR2 were omitted. They are both 100K ohms.
 - IC Z30 includes the transistor immediately to its right on the schematic.
 - In Fig. 5, the 19.8 VDC line is shown connected to the case of the DIN plug. It should be connected to pin 2 of the plug.
 - The resistor in the power supply is unmarked. It should be listed as R28, 100 ohms; 1/2 watt.
 - The bridge rectifier value is missing. It is 2 amps, 100 volts.
 - In Figs. 1 and 2, the lines labeled MRA5 and MCA5 should read MRAS and MCAS.
 - The lines labeled M, MA, C, CA, MD, and CD were not clear. "M" means a connection to the matching line on the high-resolution board; "C" indicates a connection to the computer's edge connector. For example, CD1 means computer data line 1, and MA13 means high-resolution board address line 13.
 - In the text in the first paragraph on page 60, a V-Sync and H-Sync control is mentioned. These references are to

an earlier working version of the board; none are needed in the version shown.

There has been some reader interest in a PC board for The Detailer. If you are firmly interested in a board priced at the \$50 level (less parts), please drop me a post card—not a letter. PC boards are frightfully expensive to produce. I found that out when the 70 folks demanded a PC board for the Micro Front Panel project and it up and up and disappeared into the postal twilight zone.

● Speaking of the Micro Front Panel (ahem), it is now available as a complete kit of parts for \$45, or PC board alone for \$15, from MSB Electronics (see above).

● Finally, some humor. I've spoken occasionally of bruised machines which nestle temporarily on my workbench. When I opened the computer Dan sent, I was reminded of illustrator B Kliban's "How To" cartoons. So, with apologies to Kliban and sympathies to Dan, I present Photos 9 and 10—before and after shots of a poor Model I. ■

Upcoming

Buffers, bubbles, and blips.

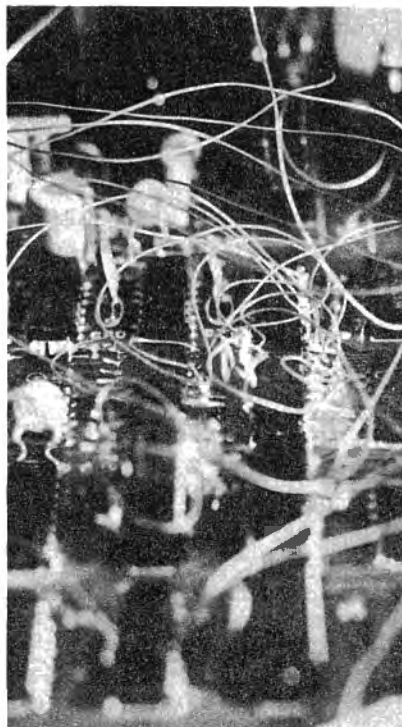


Photo 9. Wrong.

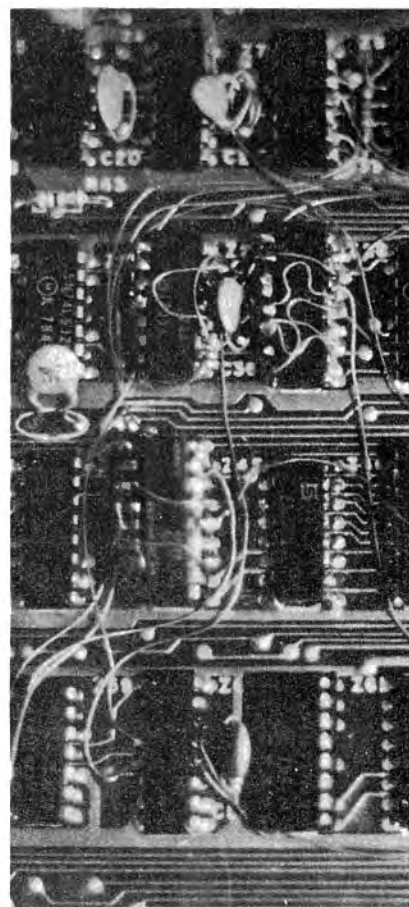
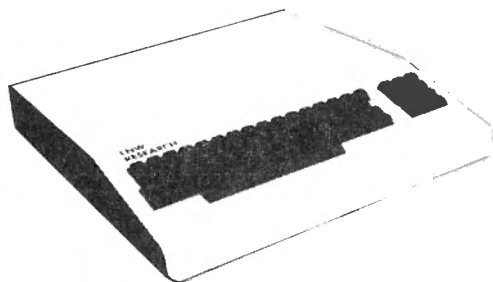


Photo 10. Right.

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SERIAL RS232 PORT	YES	YES	YES
PRINTER PORT	YES	YES	YES
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NEW PRODUCTS

edited by Janet Fiderio

Business Feature—The CR-180 Cash Register/POS Expansion System



The CR-180 cash register/POS expansion system

Cash Register Expansion System

The CR-180, a cash register/POS expansion system for the TRS-80 Model III has been announced by FutureSoft and ICR. The system includes an electronic cash drawer and receipt printer which plug directly into the TRS-80 Model III. (The software will support Radio Shack or other printers.) Audio has been added for keystroke confirmation.

The CR-180 software provides the operator with continuous instructions at the point of sale and allows management to rapidly change promotional messages printed on customer re-

ceipts and displayed for the operator.

CR-180 stores transactions for up to 100 employees, saves eight methods of payments and provides inventory control and complete reporting. The system produces reports including daily sales and cash reports by employee and by transaction type, inventory usage and gross profit computation. Price and shelf labels are also printed.

Software for the Cash Register Expansion System was developed by FutureSoft and is available in foreign language versions. Prices range from \$900 to \$1900. Contact ICR/FutureSoft Southern Region, P.O. Box 1446, Orange Park, FL 32073, for information.

Reader Service ✓ 161

Word Processor For the Color Computer

C. C. Writer is a line-oriented word processor designed for the TRS-80 Color Computer with Extended Color Basic and 16K. The program may be initialized in a 32K format to take advantage of the ex-

pansion products available. C. C. Writer is written in Extended Basic.

The menu allows full control of margins, line spacing, justification, paragraph indentation and page pause for single sheet feeding. Commands embedded in the text control include line skipping and forcing, new paragraphs, page forcing, centered texts, tabs and indentation

of both margins. ASCII control codes may be inserted in the text to control "smart" printers or create print graphics.

Editing abilities allow insertion, deletion, or modification and blocks of text to be moved on command.

The package is priced at \$30 from Transformation Technologies, 194 Lockwood Lane, Bloomingdale, IL 60108.

Reader Service ✓ 325

Software is for Business

Occupational Software is offering two new programs of interest to the business community.

The business Accounting Control System for Models I and III features accounts receivable, billing, inventory control, accounts payable, payroll, job costing and general ledger programs. This comprehensive software system is priced at \$4500.

The Restaurant Accounting Control System features accounts payable, payroll, sales analysis, labor planning, inventory control and general ledger programs. It runs on the Model II. The system, sold by module, is priced from \$1000-\$7500.

Both systems are available from Occupational Software Co. Inc., 22311 Ventura Blvd., Suite 123, Woodland Hills, CA 91364.

Reader Service ✓ 336

Add CP/M to Mod III

The Freedom 3 is a modification that adds CP/M capability and more to the Model III. It includes added memory, memory restructuring and a battery-backed date calendar clock.

The memory addition replaces the ROM in 2K segments up to the entire 14K ROM size. The alternate memory can be either EPROM/ROM or RAM. This system is compatible with TRSDOS and other operating systems, will operate on intermixed drives and may be ordered on either 40 or 80-track disks.

Freedom 3A provides address restructuring and the operating system for CP/M for \$199. Freedom 3B is a 40K user space system also, but may be user upgraded by

adding ICs to a full RAM system, with battery back-up of either or both the clock and memory for \$340. Freedom 3C provides the full RAM, battery backed-up clock and a CP/M-type operating system that provides 54K of user space for \$490.

For more information contact Field Engineering Consultants, Ltd., Box 2368, Woburn, MA 01888, (617) 944-5329.

Reader Service ✓ 326

Ecology Simulations I

Use of a new computer simulation game, Sterl, has computerists trying to eradicate the Mediterranean fruit fly. This simulation permits the use of two methods of pest control—pesticides and the use of sterile males, either alone or in combination.

Sterl is one of four simulations in the package Ecology Simulations I. Other programs in the package include: Buffalo, which simulates the Buffalo population of 1850; Tag, a simulation of the tagging and recovery method of measuring animal populations; and Pop, a simulation of animal population management.

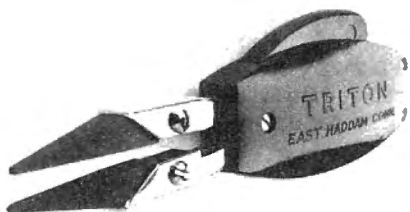
Available for Model I, Level II, it costs \$24.95 from Creative Computing, 39 E. Hanover Ave., Morris Plains, NJ 07950, (201) 540-0445.

Reader Service ✓ 168

"HOT LIPS"— A Soldering Tool

Hot Lips is a hand held electrical resistance tool for intricate soldering operations. Its unique plier-like design enables the user to produce perfect soldered connections in tight places.

This Triton Manufacturing tool is six volts safe and is furnished with a remote transformer power supply. It's instant-heat on, instant-cool off means minimum power use. Hot Lips is sold for \$50.20 from



Triton's "Hot Lips" soldering tool.



The TRS-80 Pocket Computer Printer and Interface.

Triton Manufacturing Company, P.O. Box 263, East Haddam, CT 06423.

Reader Service ✓ 178

Printer/Cassette Interface For The Pocket Computer

Radio Shack now offers a printer and cassette interface for its Pocket Computer. This product comes with batteries, an ac adapter/charger, cassette recorder connecting cable, replaceable printer ribbon cartridge, additional rolls of paper and an owner's manual.

The cassette interface allows programs and data to be loaded, saved and recalled. A remote switch allows manual control of the tape recorder. Connections between the printer/cassette interface and the computer are made directly, without cables.

This printer/cassette interface is priced at \$149.95 from Radio Shack, 1800 One Tandy Center, Fort Worth, TX 76102.

Reader Service ✓ 337

Educational Games

Jabbertalky is a programmable word game for one or more players. It includes two game features, a utility program and eight levels of skill.

The first, Alphagrammar, an anagram game, challenges players to unscramble an entire grammatically correct sentence. The second game, Cryptogrammar, is a code-breaking game in which players are given a computer-generated sentence where each letter of the alphabet is substituted for another letter. You must try to determine the correct arrangement before your time runs out. The special utility program, Jabbergrammar, stores lists of words for each part of speech.

Jabbertalky is available on cassette for the Model I with 16K, or on disk for 32K.

Contact Automated Simulations, Inc., Box 4247, Mountain View, CA 94040, for more information. The retail price is \$29.95.

Reader Service ✓ 345

Magikube, the Computerist's Version of Rubik's Cube

Magikube is a game available on cassette for the Radio Shack Color Computer.

Based on the Rubik's cube, you have the option of scrambling the cube yourself or letting the computer do it. The objective is to restore the cube back to its original state. Magikube also has a tape save feature allowing you to save your cube and continue at a later time.

Magikube costs \$19.95 and is available from Computerware, Box 668, 1472 Encinitas Blvd., Encinitas, CA 92024, (714) 436-3512.

Reader Service ✓ 162

Program Evaluates Solar Systems

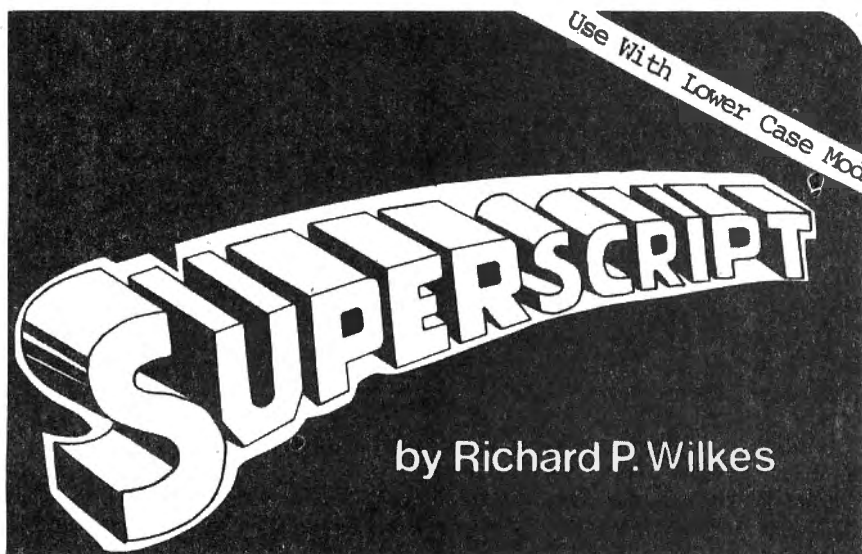
Sunheat1 is used to put together and evaluate a variety of solar hot water systems. It will determine the effectiveness of various types of solar collectors, heat exchangers, preheat tank sizes and hot water tank sizes for your needs.

Once the system has been configured, the program calculates the amount of useful solar energy that can be collected each month and the percentage of hot water needs that can be supplied by solar means on a monthly and yearly basis.

Sunheat1 is written in Basic and requires a Model I Level II with 16K; the cost is \$16. For more information contact Solartek, Box 298, Guilderland, NY 12084.

Reader Service ✓ 344

NEW PRODUCTS



Superscript

Superscript For the Model III

Acorn Software has developed a Model III version of Superscript for the TRS-80 with 32K of RAM, expansion interface, disk drives and lowercase modification.

The product features: directory and kill-files from within Superscript; ability to pause while printing and insert text; serial drivers which use the ETX/ACK protocol for 1200 baud communications; special drivers for various printers; ability to superscript, subscript, underline, boldface, select 10/12 pitch, or use brackets, braces, carets, and more.

Superscript costs \$50 and is available from Acorn Software Products, Inc., 634 North Carolina Ave., S.E., Washington, D.C. 20003, (202) 544-4259.

Reader Service ✓ 350

The Newest Versamodem

Bizcomp Corporation's newest Versamodem, the Model 1080, provides users needing only a minimum feature modem with a direct-connect alternative to older acoustic couplers.

The modem can be used with personal computers at rates of 300 baud and below using Bell standard 103 protocol. The Versamodem is FCC registered and supplied with a modular plug for direct connection to the telephone network.

The price of the modem is \$119 and is available from the Bizcomp Corporation, Box 7498, Menlo Park, CA 94025, (415) 966-1545.

Reader Service ✓ 335

Precision Template

ABS Suppliers is offering a new product that will increase your disk storage capacity 100 percent. The ABS-Doubler is a precision template that permits the conversion of single-sided disks to double-sided disks.

The Doubler is sold by ABS Suppliers, Box 8297, Ann Arbor, MI 48107, (313) 971-1404, for \$3.50.

Reader Service ✓ 171

Disk Speed Measurement For the TRS-80

RPM measures the rotational speed and variation of disk drives on the TRS-80 Models I and III. RPM makes it very easy for the user to see the speed, percent error, and history of speed variation on any mini-floppy connected to the TRS-80.

Readouts are given in real-time, and are shown in numbers, percents, words and graphs. With one keystroke any drive may be selected. RPM automatically shows all speed ranges and can recover from severe errors without requiring a system reset.

The product is available on disk for \$24.95 from Prosoft, Box 839, North Hollywood, CA 91603, (213) 764-3131.

Reader Service ✓ 327

Graphics Editor and Programmer

The Graphics Editor and Programmer is a hybrid program that is part text editor, screen drawing utility, and Basic program

creator. This product requires no knowledge of basic programming skills.

GEAP contains a full command library which allows you to create screen images and formats. The software will save your drawing by constructing a Basic program. The program will stand alone, does not require any special drivers or operating systems and will recreate the screen image you have drawn.

The Graphics Editor and Programmer is available for the Model I priced at \$16.99 from J F Consulting, 74355 Buttonwood, Palm Desert, CA 92260.

Reader Service ✓ 331

Eliminate Tedious Commands

Autofile allows the Basic programmer to automate the task of moving data elements to and from a direct file.

Autofile has eliminated the Field statement thereby eliminating guessing as to where the Fielded variable is. In addition the ASC and CHR\$ function references will be performed automatically.

The price of this product is \$75. For more information contact Snappware, 3719 Mantell, Cincinnati, OH 45236, 1-800-543-4628.

Reader Service ✓ 341

District Courseware Authoring System

CASE, the District Courseware Authoring System, consists of 14 programs on two disks and two cassettes. It is of interest to school districts.

CASE provides for the centralized development of customized courseware for controlled distribution throughout an entire school system. This system does not require a knowledge of programming; includes automatic lesson to lesson branching, performance records on disk by date, time, student ID, lesson and question, and more.

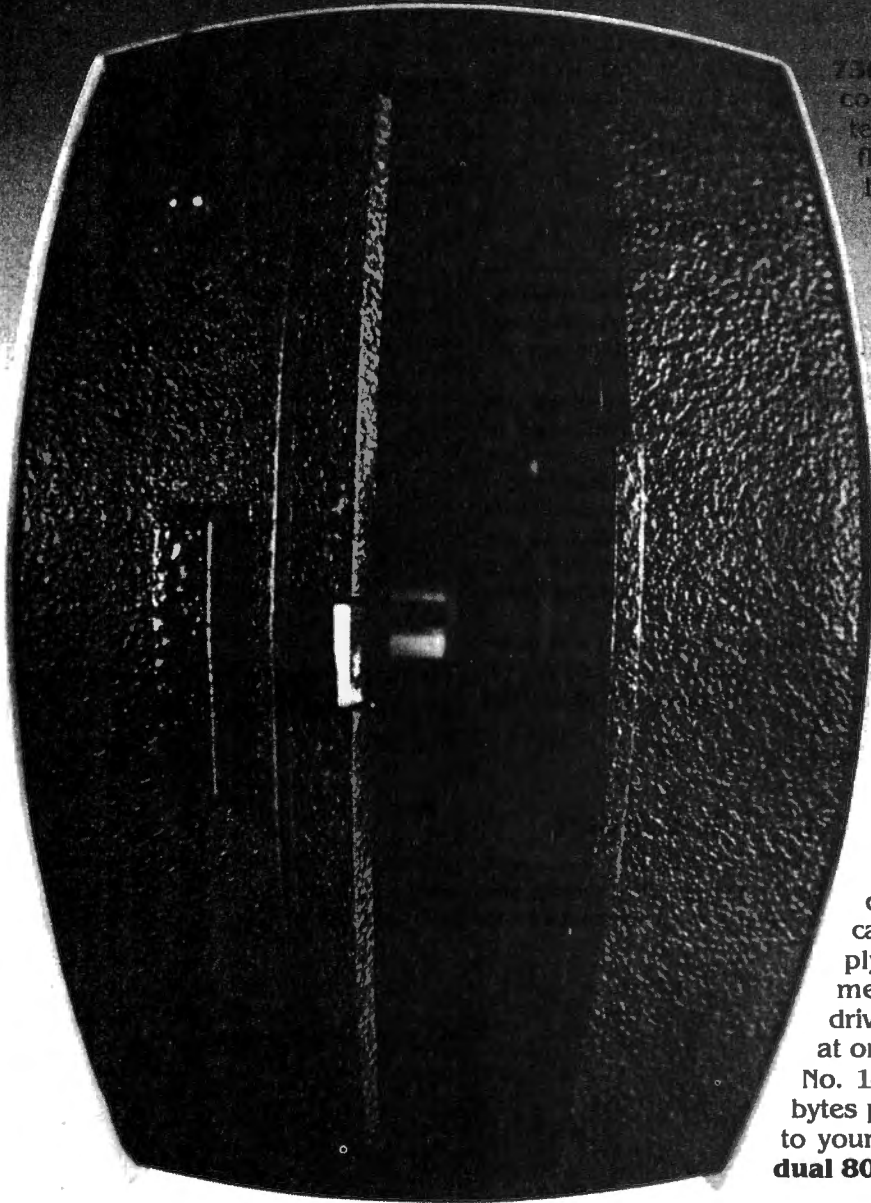
For information contact the Micro-Gnome Division of Fireside Computing, Inc., 5843 Montgomery Road, Elkridge, MD 21228, (301) 796-4165. The cost of this courseware is \$395.

Reader Service ✓ 160

Software Development System

The SDS80C is a complete 6809 editor, assembler and monitor package contained in one Color Computer program pack.

APPARAT OFFERS More bytes per buck!

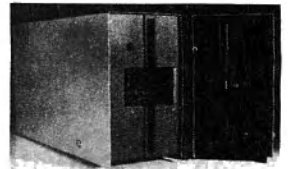


735 K/bytes of storage. Apparat has combined its Newdos/80 operating system and a dual-sided 80 track mini-floppy drive to give you up to 735,440 bytes of storage in a single volume. Newdos/80 version 2.0 expands the capability of double density drives, so you'll have greater applications for your TRS-80® model I and III.

Drives plug directly into an expansion interface (requires installation of a double density controller) or the model III disk bus with our single volume cable so you can now have over 2 megabytes of storage on-line with standard mini-floppy diskettes. Each drive has up to 573 free grants, for a total of 1,719, on a maximum of three 80 track drives, which can be added to a TRS-80 model I. Model III's can have up to 4 dual 80's on-line (almost 3 megabytes).

These drives can "read" standard 35 or 40 track diskettes using Newdos/80 version 2.0 which will allow skipping every other track.

Drives come complete with case, power supply and documentation. The drives are priced at only **\$515** (Cat.



No. 1-705, specify I or III). Now, at 1424 bytes per buck, it just might be the answer to your storage problems. **Special - Two dual 80 track drives only \$999.**

 **Apparat, Inc.**

4401 So. Tamarac Parkway, Denver, CO 80237 (303) 741-1778

264



"ON GOING SUPPORT FOR MICROCOMPUTERS"

NEW PRODUCTS

The screen-oriented editor features finds, changes, moves, copies and more. All keys have auto repeat, and no line numbers are required so the full width of the screen can be used to generate commented code.

The assembler features a complete 6809 instruction set, a complete 6800 set supported for cross-assembly, conditional assembly, local labels, assembly to cassette tape or memory, listing to screen or printer and mnemonic error codes instead of numbers.

The ABug monitor is a compact version of CBug. It features examine or change of memory or registers, cassette load and save, break-points and more.

SDS80C is priced at \$89.95 from The Micro Works, Box 1110, Del Mar, CA 92014, (714) 942-2400.

Reader Service ✓ 332

Software for Physicians

Medical Office Management is a software applications package which provides medical offices with a system which maintains general patient information files, office appointment schedules, maintains and prints the daily transactions log, prints procedure-by-procedure management reports, prepares and prints private patient bills, and prepares patient insurance claim forms.

The system includes an online Help function in addition to extensive documentation. This software requires either two or three disk drives, a 130-column printer, and a 48K Model I Level II or Model III (Basic III) with TRSDOS. The price is \$499.95. For more information contact Charles Mann and Associates, Micro Software Division, 55722 Santa Fe Trail, Yucca Valley, CA 92284, (714) 365-9718.

Reader Service ✓ 347

Sales Tax Calculator

For small businesses reporting state sales taxes quarterly, Manhattan Software has released the TRS-80 Sales Tax Calculator.

The program automatically separates entries coded taxable, calculates and displays the tax on screen, and adds sales categories and tax due. The user may optionally enter tax actually charged on each sale. The program will hold up to 500 entries in 16K, and 1500 in 32K.

The cassette is priced at \$14.95 for Models I and III. For more information contact Manhattan Software, Box 1063, Woodland Hills, CA 91365, (213) 704-8495.

Reader Service ✓ 330

Create Formatted Screen With a Single Command

Automap simplifies the programmer's task of communicating and displaying information with the user-operator. Simple send and receive statement commands will communicate and display the information you want.

Automap is available for Models II and III for \$100. For more information contact Snappware, 3719 Mantell, Cincinnati, OH 45236, 1-800-543-4628.

Reader Service ✓ 342

For your Typewriter

Dynatyper/Dynastar is a new typewriter system designed to generate printouts directly from computer output through any electric typewriter.

The interface fits directly over the keyboard and requires no modification to your typewriter. It is RS-232 serial, Centronics parallel, IEEE 488(GPIB) and 15-pin current loop compatible. Features include a 3.5K RAM buffer, 37.5 to 9600 switch-selectable baud, top-of-form option, 80 or 132 option, and downloading capability to four special character sets.

It is available for Models I and III for \$699 from Rochester Data, 3000 Winton Road, South, Rochester, NY 14623, (716) 244-7804.

Reader Service ✓ 164

Model II Gets SoftCare

SoftCare, a medical billing system, previously used only on minicomputers and

larger Z80 systems, is now available for the Model II.

It prepares patient bills and insurance claims, maintains accounts receivable and transaction details and is user-friendly.

It is available for \$1995 from Professional Business Software, 119 Fremont St., San Francisco, CA 94105.

Reader Service ✓ 340

Energy Saving Analysis

The Home Energy Cost Saving Analysis program for the Models I and III is designed to evaluate the cost/benefit of heat saving home improvements.

To accomplish this the program models the current surface area of your home using the "R" factor of each material used to construct your home. The computations for 29 building materials and seven types of heating fuels are used to compute the cost of heating and the fuel saving payback period for the improvement being considered.

This program is available for \$9.95, from Demi-Software, 6 Lee Road, Medfield, MA 02052, (617) 359-4502.

Reader Service ✓ 167

Timing Program for Stock and Commodity Traders

Stock Timer is a program that calculates and plots up to three uniform or exponential moving averages of the user's choice on a common set of price or volume data. The interaction of these moving



The Dynatyper

SAVE / on Software for TRS-80®

NEWDOS/80 Version 2.0

The most sophisticated DOS ever produced for the TRS-80® Models I and III. It provides the user with "MAINFRAME" power on a "MICRO".

Some Features available are:

- Jobstream Control Language
- Mod I/Mod III Diskette interchangeability
- Double Density Support on Model I
- Pagenation of BASIC listings on the screen
- Basic program single stepping
- Dynamic variable manipulation
- Multiple array sorts
- Complete technical support provided

All this plus much more for only

\$149.00

MICRO ACCOUNTING SYSTEM

Accounting by the book for the non-accountant. Menu driven for ease of operation. Single or Double entry bookkeeping, complete system allows INTERACTION between General Ledger, Accounts Receivable, and Accounts Payable or each sub-system can be ran stand alone. Maintenance programs and detailed reports support numerous applications. User friendly support provided by the authors. Write for a complete description and sample printouts today!

Complete System	\$489.00
General Ledger	\$159.00
Accounts Receivable.....	\$159.00
Accounts Payable.....	\$159.00
Check Register.....	\$ 79.00

CHEXTEXT®

Let your TRS-80® do the proofreading on your SCRIPSIT® text files!

Features of this program include:

- Complete dictionary maintenance including the addition and deletion of words.
- Menu driven for ease of operation.
- FREE expanded dictionaries available, depending on your drive storage capabilities.

NEW LOWER PRICE \$59.95

THE MICRO CLINIC

by Dave Stambaugh

"An ounce of prevention is . . ."

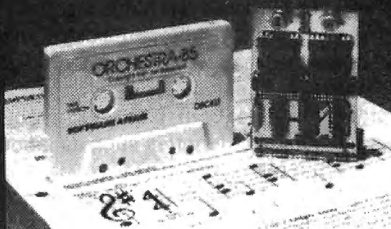
Routine system checkout will help prevent that dreaded loss of data. A thorough system checkout includes both Memory and Disk diagnostics. The Micro Clinic offers the most exhaustive set of routines known of for the Model I or III. Don't take chances with your data, a routine system checkout is your best friend.

". . . worth a pound of cure."

Model I version	\$24.95
Model III version	\$29.95

MUSIC TO YOUR EARS!

For your Model I disk or tape



Orchestra 80	\$ 79.95
Orchestra 85	\$129.95
Orchestra 90	Available Soon!

Assorted Items of interest

Lazy Writer (Mod I disk)	\$125.00
Lazy Writer (Mod III disk).....	\$175.00
Meal Master (Mod I & III disk)	\$ 24.95
Scarfman (disk)	\$ 19.95
(tape).....	\$ 15.95
Flextext I (mod I & III disk).....	\$ 29.95
Flextext II (mod II disk)	\$ 29.00
Big five games (mod I & III)	
disk.....	\$ 19.95
tape	\$ 15.95
MTC CALCS IV (mod I disk)....	\$ 39.95

ATTENTION: Our marketing department is constantly searching for high quality professionally written software.

ATTENTION DEALERS: Write for our dealer packet today.

PROFESSIONAL FOOTBALL PREDICTIONS

\$29⁹⁵

- Makes predictions for all 14 NFL games each week.
- Game predictions are incredibly accurate.
- Program's data base is updated weekly from your local newspaper's game statistics.
- Keeps complete record of all final scores and standings.
- Re-useable year after year.
- Very sophisticated program, yet easy to operate.

FOR YOUR TRS-80® Model I or III

*NOTE: Start saving your game results at the time of your order, APPARAT will provide the data base for the previous weeks games on the disk.

MISCELLANEOUS SUPPLIES

DISKETTES

Double density-soft sectored-replacement guaranteed-Hard Hole protected. (5¼" only)	
Verbatim Datalife 5¼" 40 track.....	\$24.95
Apparat's No Name 5¼" 40 track.....	\$21.95
Verbatim Datalife 8" model II.....	\$39.95

PAPER

9½"x11" blank white, tractor feed paper, full box	\$24.95
9½"x11" blank white, tractor feed paper, half box	\$14.95
14½"x11" green bar, tractor feed paper, full box.....	\$34.95
3½"x15/16" tractor feed mailing labels.....	\$19.95

OTHER

5¼" plastic library case	\$ 3.95
8" plastic library case.....	\$ 5.95
5¼" Flip-sort	\$29.95
8" Flip-sort.....	\$39.95
16K memory kits	\$19.95

UNPRECEDENTED 90% DISCOUNT SALE

On MODEL II Commercial Grade Business Software
(LIMITED Quantities Available)

TITLE	LIST PRICE	SALE PRICE
General Ledger	\$300.00	\$30.00
Accounts Receivable	\$300.00	\$30.00
Accounts Payable	\$300.00	\$30.00
Inventory	\$300.00	\$30.00
Order Entry Processing	\$300.00	\$30.00
Sales Analysis	\$300.00	\$30.00
Word Processing	\$400.00	\$40.00

*All systems include extensive situation oriented documentation, but is supplied on diskette only.

*Above software sold as is and require a minimum of 64K and two drives.

(Sorry, but at these ridiculously low prices our usual software support will not apply.)

ADD \$3.00 for postage and handling for these items.



Apparat, Inc. ²⁶⁴

"On-going Support for Microcomputers"

4401 S. Tamarac Pkwy. • Denver, CO 80237 • (303) 741-1778 • (800) 525-7674

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Freight F. O. B. Denver-call for shipping charges. Foreign Orders shipped Air Freight



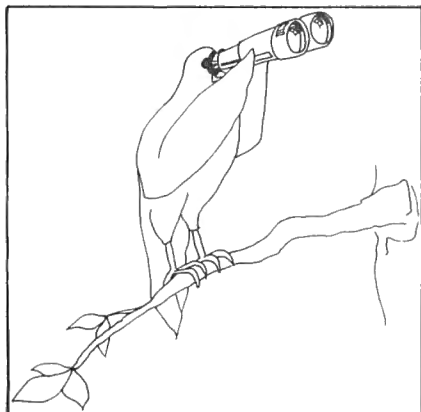
NEW PRODUCTS

averages produces the customary buy and sell signals.

Stock Timer also includes a data base management system for the necessary price and volume information.

It is available for Models I, II, and III in tape or disk versions with 16K or more of memory. For additional information contact Bayesian Investment Services, 757 Santa Rosita, Solana Beach, CA 92075. The tape version is priced at \$26.95, the disk at \$31.95.

Reader Service ✓ 343



For the Bird-watcher

Life List is a program for the bird-watcher. It is a one-disk record of bird sightings which holds bird name, sighting date, location and notes for 450 sightings.

Data in the program's search files can be edited to reflect species name changes or later sightings. The program will display individual records on-screen or an index of all sightings. A special search feature allows the user to find all birds seen on any date, in any month or in any year and display them together on the screen. Similar searches will find all sightings at a particular location or all birds of one name group.

Life List is available on disk for the Model I for \$24.95 from Manhattan Software, Box 1063, Woodland Hills, CA 91365, (213) 704-8495.

Reader Service ✓ 334

Mailing List System

Mail-M3 is an advanced mailing list system for the Model III and TRSDOS. This program features multiple labels (up to four) across a page, form input, a report writer, fast multi-sort keys, duplicate label checking, random access, search and more.

Mail-M3 is not "on-memory" so the entire database does not have to be sorted

each time you add records. One disk can store about 500 records of 127 bytes each, or more if you have additional drives.

Mail-M3 comes in two versions. The enhanced 48K version is priced at \$79, while the 32K version is \$59. Both are available from the Micro Architect, Inc., 96 Dothan St., Arlington, MA (617) 643-4713.

Reader Service ✓ 173

For Manufacturing Cost Estimating

Two software packages designed for manufacturing, engineering, consulting and analytical applications are available from Centec Process Systems, Inc.

The MCE package allows the user to estimate detailed manufacturing costs based on individual specifications. Information is organized under both fixed and variable costs including categories such as labor, utilities and raw materials.

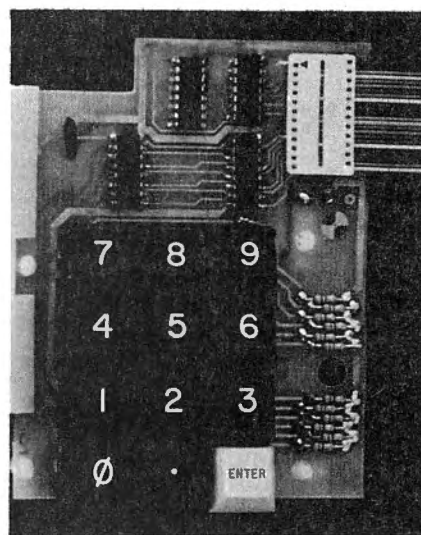
The DCF package is designed for corporate managers, financial advisors, certified public accountants, tax consultants, and real estate and building analysts. Applications include detailed cash flow, rate of return and payback, escalation of income and individual costs, and more. Separate interest rates can be used for borrowed and working capital.

The MCE system is priced at \$75, the DCF at \$125. Both systems are priced at \$149 from Centec Process Systems, Inc., 11260 Roger Bacon Drive, Reston, VA 22090, (703) 471-5999.

Reader Service ✓ 165



Software from Centec Process Systems



The Control Key Hardware

Control Keys For the TRS-80

The Control Key system is a hardware and software combination that allows control of the Model I 32K, or 48K disk system with single keystrokes.

The hardware converts the numeric pad on the TRS-80 into a set of 12 programmable special function keys that can be accessed by either machine language or Basic programs. When used in conjunction with the four currently available Control Key programs, each of the numeric keys perform specific functions such as execution of the most frequently used DOS functions, rapid input and debugging of Basic programs, and more.

The cost of the system assembled is \$150. Kits are also available. Contact Clockwork Software, Box 704, Colorado Springs, CO 80901, for additional information.

Reader Service ✓ 346

New Software Catalogue

Charles Mann & Assoc. has released a new software catalogue of office management software for several microcomputers including the TRS-80 Models I and III.

The catalogue covers the field of small business office management applications from simple desk management and appointment systems to detailed job cost accounting applications.

It is available from Charles Mann & Assoc., Micro Software Division, 55722 Santa Fe Trail, Yucca Valley, CA 92284.

Reader Service ✓ 339

Master Disk Index

The Master Disk Index (MDI), creates and maintains a master file of disk directories updated by automatically reading each disk's directory.

MDI records may be selectively displayed, printed, or deleted by either string matching or record number. The entire file may be sorted by a fast machine code sort.

It is available on cassette with minimum machine requirements of 32K, 1-disk, TRSDOS, NEWDOS, or NEWDOS80 for \$16. For more information contact Custom Software, Box 3241, Poughkeepsie, NY 12603.

Reader Service ✓ 170

CBug Monitor

The CBug monitor, offered by the Micro Works, has 19 commands and is relocatable and reentrant.

The monitor allows you to: examine or change memory using a formatted hex display, save areas of memory to cassette in binary, download/upload data or programs to a host system, move the video display page through RAM and send or receive RS-232 at up to 9600 baud.

It will also investigate and activate features of your computer, such as high-resolution graphics and machine-language music, or use the computer as an intelligent peripheral for another computer.

Available on cassette, the monitor cassette price is \$29.95. For additional information contact The Micro Works, Box 1110, Del Mar, CA 92014, (714) 942-2400.

Reader Service ✓ 333

T-ROM II Utility

Microbyte Research and Development Corporation currently is marketing the T-ROM II.

The T-ROM II features include: blinking block cursor, keyboard debounce, auto repeat on any key, audible key-beep, auto-line feed, lowercase driver, video to printer echo, shiftlock, screenprint and the dual-case typewriter function. Graphics functions are retained in the lowercase mode, and normal Level II Basic commands are unaffected.

The cassette version sells for \$15.95, while the disk version is \$19.95. Contact Microbyte Research and Development, 105 Rackley Drive, Greenville, NC 27834.

Reader Service ✓ 349

New Disk Subsystem

Matchless Systems now introduces the MS-800C disk subsystem compatible with the TRS-80 Model II and other microcomputers.

The subsystem includes case, power supply, fan, cables and a choice of four different drive configurations: one single-sided drive for \$1050, two single-sided drives for \$1595, one double-sided drive for \$1395, and two double-sided drives for \$2095. Single and double-density controllers and software are available at an additional cost.

For more information contact Matchless Systems, 18444 South Broadway, Gardena, CA 90248, (213) 327-1010.

Reader Service ✓ 328

For the Software Author

Programmer is a new monthly newsletter for those interested in the software market. Scheduled for debut this month, it will cover what kind of software is selling and who is selling it, with market updates of opportunities in the software field.

Programmer's monthly columns will bring together professional writers and published programmers who will be talking about the principles of good programming and the techniques that make a program saleable. The editors of *Programmer* will be examining contracts from software producers, surveying royalties and offering the programmer advice on good business practice.

A six month subscription is \$13. For additional information contact *Programmer* Box 3210, Manchester, NH 03105.

Reader Service ✓ 179

Lunar Lander— Based on Physics

Lunar Lander is a game based solidly on physics. The computer displays the lunar landscape, your landing craft and navigational information—all of which are changing constantly. Lunar Lander teaches the concepts of acceleration and velocity.

Minimum requirements are 16K Level II Basic. A cassette is available for \$10 from Custom Software, Box 3241, Raymond Ave., Poughkeepsie, NY 12603

Reader Service ✓ 169

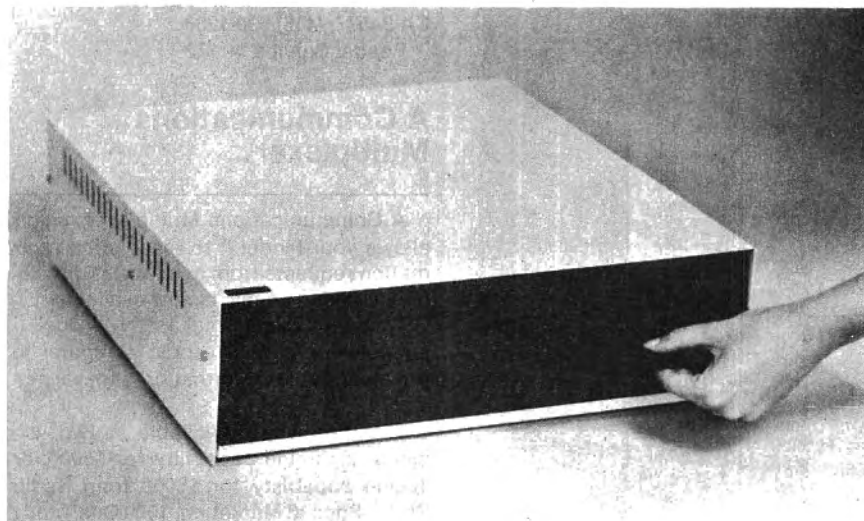
Scriptus Modifies Scriptit

Scriptus is a modification to Scriptit which enables you to take advantage of the special functions, features and print formats of your printer while your document is being printed, all in accordance with the limitations and capabilities of the printer.

Scriptus will not crash programs held in high memory and provides the following features: It will alphabetically list a disk directory from within Scriptus; optionally select line feed after carriage return; support custom printer drivers; and is compatible with VTOS, LDOS, TRSDOS, DBLDOS and NEWDOS.

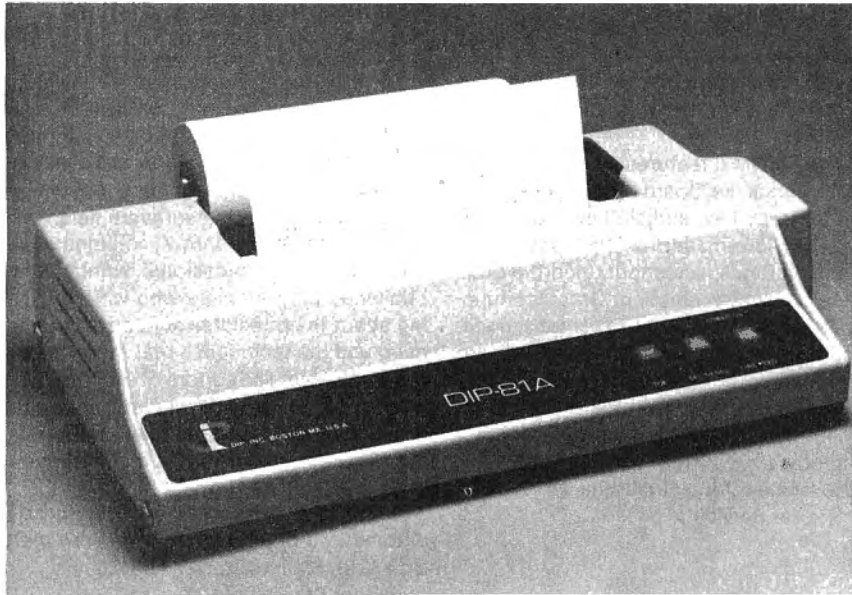
For more detailed information on Scriptus features contact Quality Software Distributors, 11500 Stemmens Exp., Suite 104, Dallas, TX 75229. Scriptus is priced at \$24.95.

Reader Service ✓ 329



Matchless Systems MS-800C

NEW PRODUCTS



The DIP-81A

New Data Impact Printer

DIP, Inc., is now marketing a new low-cost data-impact printer, the DIP-81A.

This dot-matrix printer features a full 96-character ASCII set and is capable of printing at both 40 and 80 characters per line on 8½-inch paper. Operator control includes power, select/deselect, line feed, top of form, and self test. It has the ability to accept data as it is printing and is suited for such applications as CRT dump for printouts and more.

For additional information contact DIP, Inc., 745 Atlantic Ave., Boston, MA 02111, (617) 482-4214. The price of the DIP-81A is \$499.

Reader Service ✓ 163

For All Gamesmen

The Voyage of the Valkyrie, a game for the Models I and III, has 10 levels of skill.

As you move through the Island of Fug-loy songs of success or failure ring in your

ears as each battle with the bird-like creatures rages to an end.

Voyage of the Valkyrie is available on cassette for \$34.95, or disk for \$39.95, from Advanced Operating Systems, 450 St. John Road, Michigan City, IN 46360, (219) 879-4693.

Reader Service ✓ 348

BASF-DPS Cassette Tape

BASF-DPS tape is now available from York 10 Computerware in C-10, C-20, C-45, and C-90 lengths.

BASF has an extra smooth, durable media surface which increases head life as well as permitting higher density recordings. A five-screw shell fits all Phillips type cassette recorders.

One dozen cassettes, bulk pack, cost \$8 for the C-10 length, \$10 for C-20s, \$13 for C-45s, and \$21 for C-90s. Contact York 10 Computerware, 24573 Kittridge St., Canoga Park, CA 91307, (213) 710-1430, for additional information.

Reader Service ✓ 166

MicroPlan

The MicroPlan Financial Modeling program, for the Model II, was developed to reduce time-consuming forecast and budgeting functions into a 15-minute task.

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The plan runs under CP/M and is provided with complete documentation. For more information contact Data Technology Industries, 700 Whitney St., San Leandro, CA 94577, (415) 638-1206.

Reader Service ✓ 172

A Communications Multiplexer

A Communications Multiplexer, which allows your Model II to respond to information requests from as many as 16 telephone lines at once, is now available.

This multiplexer makes the Model II suitable for use as a host computer in private Videotex information retrieval networks.

This product is available in two versions: eight-line capability for \$6000; or 16-line capability for \$8000 from Radio Shack Special Marketing, 1600 One Tandy Center, Fort Worth, TX 76102.

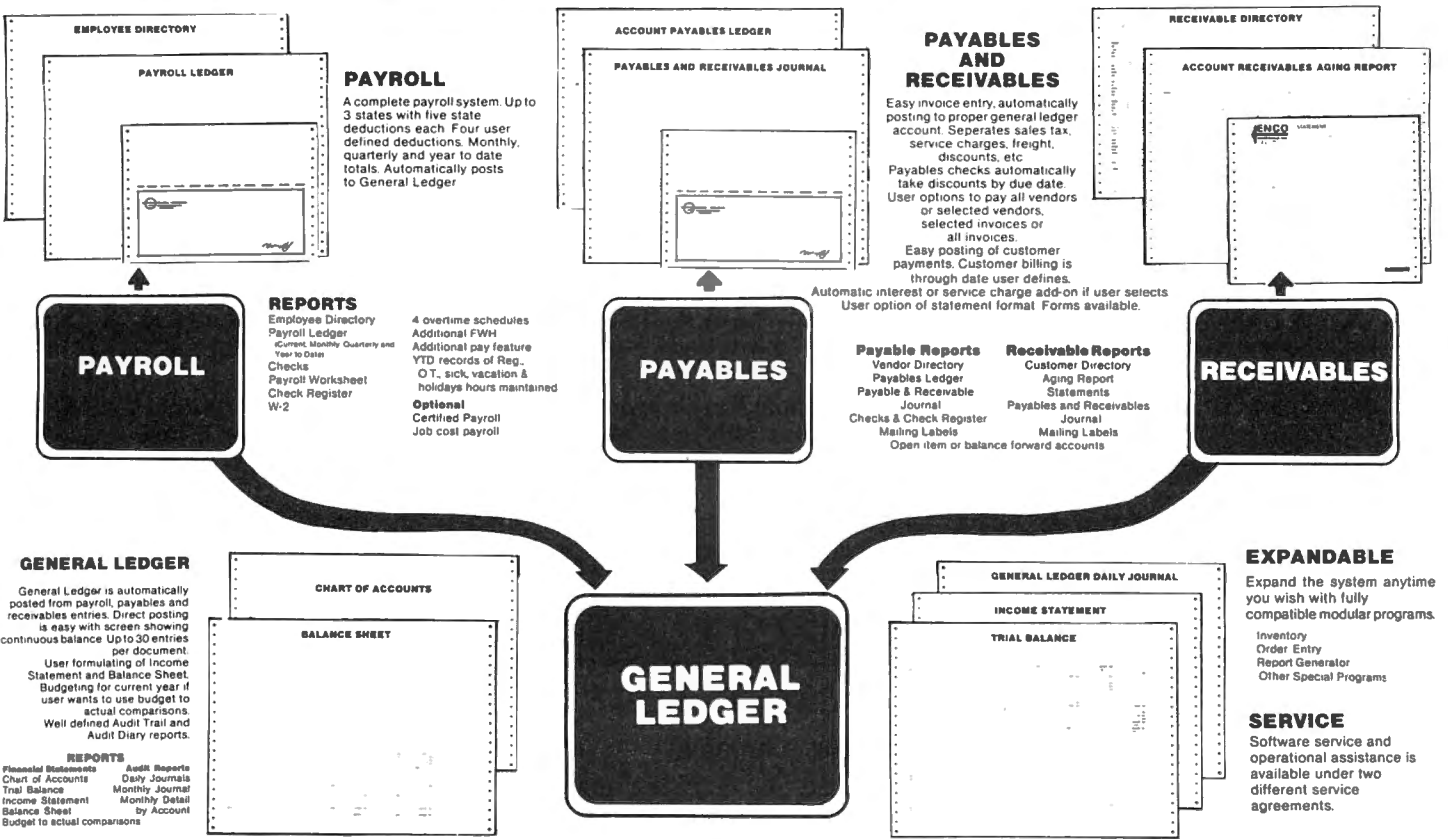
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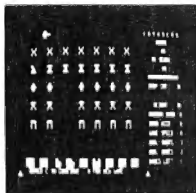
LOST COLONY

By David Feitelberg



The scene is "Warren's World," the world's first attempt at colonizing a planet in deep space. The next support ship from Earth isn't due for about 15 years, and . . . well, let's just say that things aren't going too smoothly. An election was held for an economic manager to straighten things out, and guess who won! You are presented with all the human, natural, and industrial resources of the planet, with instructions either to make things better or be voted out of office in shame. A remarkable simulation, LOST COLONY arms you with maps and charts as tools for resource management. You assign human and robotic labor forces, explore new land, and allocate production quotas. At the same time you must determine equitable pay scales and taxes that will both optimize productivity and keep the populace happy (or at least quiet and working).

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INVADERS FROM SPACE

By Carl Miller

A fast machine language approach to this classic (and addictive) space game. The aliens drop bombs, move around, and try to overrun your bases.

You choose the speed, enemy bomb frequency and accuracy, and how many shots and bases you have. Unlike other games of this type, you can move your base and simultaneously fire at the invaders. Fun for all ages and skill levels, it has full sound effects for even more excitement.

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By John Allen

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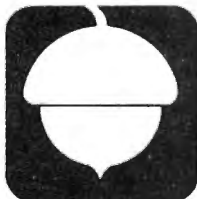
SPACE ROCKS

By Steven Kearns

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EVEREST EXPLORER

By William Godwin & Don Knowlton

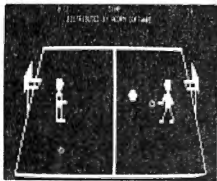


Towering above the clouds, the summit of Mount Everest is a forbidding spot. Only a handful of daring adventurers have made it to this five-mile-high pinnacle where the air is thin, violent storms erupt with little warning, and danger lurks at every footfall.

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Computerization Of the Workplace



by Chris Brown
Technical Editor

Can it be that we, the true believers in the Computer Revolution, labor under a misapprehension? For years we have told anyone who would listen that the dawn of the computing age would herald a renaissance in the American workplace. Changes for the better were coming.

We saw the machine ending the costly and time-consuming paper chase in the American office. We saw it freeing us from repetitive and demeaning operations on the production floor. We saw it enhancing our lives. Well, for many children of the computer age, the promise has failed.

Early in the summer of 1981 one national group of workers deeply involved in computers walked off their jobs. By most stan-

dards, these people were well-paid. They were willing to risk fines, firing and imprisonment for intangibles that had not been issues in the American labor movement before. Professional stature, recognition, and the relief of job-induced stress lead the air traffic controllers to strike. In striking, the controllers were typical of a new breed of American worker—a worker involved with technology and the computer, the victim of problems created by the machines in the American workplace.

"Computer technology creates the false illusion that problems with the American workplace are over," says Harley Shaiken, an MIT researcher of advanced technologies. Shaiken went on to tell *80 Microcomputing* that in his view a new set of labor related problems is spawned by the computer. He said, "Computer technology has always had the potential to create a better workplace. The reality of the situation however, has been the opposite. The computerized workplace has been deteriorating in quality."

Shaiken understands the hostility displayed by many workers involved with computers. He sees three key factors at the root of dissatisfaction of data processing personnel, air traffic controllers, nurses and operators of computerized machine tools. He feels that computerizing the workplace limits worker skills, increases management control and allows constant monitoring of worker performance. While not particularly evil in themselves, these three factors taken together dehumanize the worker.

A similar theme is sounded by Robert Shrank of the Ford Foundation. Shrank, a self-described Program Officer at Ford and an ex-tool maker, sees time as a key issue. "Control of an employee's time is the key to how the computer is affecting the American workplace. Be it a VDT (visual display terminal), machine tool, or what have you, where computers are involved an employee may be measured as to what, when and how much, as never before."

Shrank told *80 Microcomputing* that the ability to control time and employee activity

Will the postman soon bring bytes?

Digital Delivery

by Bert Latamore
Desktop Computing staff

Long distance communication has been an issue since civilization began. The ancients used drums, mirror reflection and smoke signals. When the Egyptians and Chinese invented writing, they also invented the courier and built complex road networks for their runners to travel. These courier services developed into the modern postal system. Samuel Morse started the electronic communication revolution, but not until the 1920s was the telephone widely accepted and a real competitor to postal systems.

Today the United States Postal Service (USPS) handles more than one billion first-class letters a year. Although the telephone service carries 2.5 calls for each first-class letter mailed, the post office is still a major force. Ironically, this old-fashioned method of moving information survives at the heart of the "information revolution."

The postal revolution may finally be upon us. A new form of message delivery, electronic mail, is riding on the coattails of computer networking. Futurists believe it may replace the postal system and take part of the load now carried by telephone. According to prognosticators, the question in electronic mail is not whether it will be an important force in the future but how much impact it will have and what form it will take.

As always when predicting the future, experts disagree. Some expect all first-class mail to become electronic, with users sending and receiving messages directly from terminals in their homes and offices. Others expect a more moderate use of electronic mail using facsimile equipment in post offices or other central locations.

Network Systems

These two versions of the future reflect two different forms of electronic mail. The first, used today by businesses with local networks, is available to the public from subscription services such as CompuServe, Columbus, OH; The Source, Vienna, VA; Tymnet, Cupertino, CA; and Telenet, Vienna, VA. This kind of electronic mail requires a central computer connected to terminals or microcomputers at remote locations.

Compose and address your message on your terminal, then contact the electronic mail computer you use and send it on its way. The computer stores the message until the intended receiver checks in. The computer informs the contacted party of a message and sends it to his terminal upon request.

If both parties are on line simultaneously, they can communicate in real time by alternately writing messages. The effect is much like a telephone call.

Large businesses with local networking systems use this form of electronic mail for interoffice communications. They are slow to use it for intercompany and personal correspondence, partly because various electronic mail databases do not communicate with each other. These databases use password security systems. Upon subscription to a database you are given a set of passwords; one identifies the service you want and one identifies you as a legitimate

subscriber. The database computer recognizes the password by its length and form. Because these forms and lengths are not uniform, computers cannot communicate between databases. If you subscribe to the electronic mail database at CompuServe and I am on Tymnet's OnTym we cannot send letters to each other.

Promoters of this version expect industry standards similar to those allowing the various common carrier packet networks to interconnect worldwide. A standard would enable the services to communicate freely.

Meanwhile, several subscriber-supported electronic mail services are in operation. Rich Baker of CompuServe said their mail database is put to a wide range of uses, from replying to want ads posted on electronic bulletin boards to playing electronic games. Newspapers use electronic mail to transmit stories from remote bureaus to their main offices and traveling salesmen use it to communicate with their offices.

Facsimile Systems

The second picture of the future is based on the presumption that the dominant form of electronic mail will send and receive photographic copies of documents. To use this system you would prepare your letter with a pen or typewriter. A business could prepare advertising packages as it does now. The finished product would be placed in a machine resembling a photocopier. The machine would read the document and send an exact description to the machine at the location you selected. That machine would create an identical copy.

The big advantage of this system is the control the sender has over the information's form. This might not be important in a personal letter or interoffice memo, but it is very important when the information is

“... this opposition from a politically strong White House probably means ECOM is dead.”

a graph or photograph. Unfortunately, the machinery is more expensive than a dumb terminal and less versatile than a micro-computer. It is unlikely that the average home in the year 2001 will have such equipment. This system would probably be used between central locations; individual documents would be mailed from the receiving stations to their ultimate destinations.

The USPS was scheduled to inaugurate such a facsimile system, called Electronic Computer Originated Mail (ECOM), in January. All the necessary equipment to connect several US cities has been purchased. The Reagan administration, however, is opposed to the USPS entering the electronic mail market. The White House and Departments of Justice and Commerce have jointly filed statements with the Postal Rate Commission opposing the ECOM plan and any other move into this area by the postal service. David Foulger, editor of *Electronic Mail and Message Systems*, a biweekly bulletin published by International Resource Development, Norwalk, Ct, said this opposition from a politically strong White House probably means ECOM is dead.

However, he said several other firms are waiting in the wings, ready to start their own services; Federal Express, particularly, seems to be preparing for an overnight facsimile mail delivery in competition with the USPS, and is renting satellite transmission capacity far beyond their internal needs.

In spite of the problems with ECOM and competition with desk-to-desk mail, facsimile apparently has a good future. *The Report on Electronic Mail* for the second quarter of 1981, a publication of The Yankee Group, Cambridge, MA covers the market potential of several facsimile systems designed for office use. They conclude this form of message moving will retain part of the electronic mail market because it eliminates typing information already on paper into the system. They predict facsimile transmission equipment integrated into office work-stations rather than marketed as independent items. The integrated systems would offer word processing, database access, data processing and electronic filing as well as electronic mail.

AT&T Entry

The other big communications monopoly in the United States, American Telephone and Telegraph (AT&T), is also preparing for entry into electronic mail. Presently AT&T is voluntarily going through the throes of partial deregulation.

Foulger expects AT&T will probably meet the deadline Congress has set to create a separate subsidiary operating in electronic information. The subsidiary is required so the telephone giant cannot use revenues from business areas in which it has a legal monopoly to fund adventures in other areas, an unfair advantage over competitors. AT&T will move quickly into electronic mail as well as other electronic data service areas as soon as legal requirements are met.

However, he said, “Deregulation may not be the gift that AT&T thinks it is.”

AT&T will be entering a highly competitive market in which several corporations, including GTE Telenet and Tymnet, are already established. Foulger predicts other firms will unveil ambitious systems.

Home Use

Futurists disagree whether electronic mail will be major in the home for the rest of the century; they agree on the definition of electronic mail. Ray Boggs of the Consumer Division of Venture Development Corp., Wellesley, MA, recently finished a study of the electronic home of the future. He concluded electronic mail “doesn’t fit in” as a communications device and will not replace the telephone.

On the other hand, he and many others expect electronic money transfer arrangements in our future, allowing the consumer to send orders from home directly to the bank’s computer.

“It will be precisely this kind of application that will drive the home computer market,” Boggs said. Francis O’Reilly, an independent business analyst for Business Communications Corp., Stamford, CT agrees with this scenario. He points out that financial transfers account for 90 percent of all first-class mail.

“By the end of the century, electronic money transfer is going to eliminate most of this volume,” he said, “so I think electronic mail is going to creep in in ways other than the one we think of.”

The result would be less paperwork for the customer and less data entry for the bank.

Your bills would come directly to your terminal through the network. Your employer could complete the cycle by having his computer deposit your pay directly into your bank.

Electronic Mail and the Telephone

O’Reilly also believes electronic mail may partially replace the telephone for personal

conversations. If we communicated through electronic mail I could send him my interview questions on electronic mail when I wanted to, and he could send his answers and comments back at his convenience.

“Of course we would lose the interactive nature of the conversation,” he said. On the other hand, it would save days of telephone work spent alternately calling people and transcribing answers from long lists of questions.

All these applications wait for home computers to become commonplace. It is not practical to offer these services until enough of the public can use them. O’Reilly and Foulger both predict we will reach this point by 1990.

Mail by Cable

A recent issue of *Electronic Mail and Message Systems* reported the present trend in cable television is to offer a huge selection of channels. One cable company now has a license to offer 150 channels in Princeton, NJ, and another has proposed a 200-channel cable in Florida.

Foulger wonders what they are going to put on all those channels. He suggests that some of those extra channels could carry data services into the home. The Source and CompuServe are already experimenting with cable.

Another possibility is electronic data services offered simultaneously with voice telephone transmission. Telephone lines carry several calls at once through multiplexing. According to Lawrence Roberts of GTE, the creator of the first operating packet network, there is no reason data transmissions could not be multiplexed with voice.

The French government is experimenting with this kind of service. At least one French firm manufactures a telephone modem allowing simultaneous voice and digital data transmission, according to Foulger.

Business Mail

Vision is clearer in the business world, where the trend for electronic mail as part of the electronic office is gathering strength. So far, O’Reilly said, electronic mail is “a large corporation phenomenon. The smaller organizations have the communications network to do it, and I think they have the need.”

Electronic mail is used in three situations:

- In office complexes, where it is incon-

"The lengthy Canadian mail strike divided the electronic mail sheep from the goats. . ."

venient for one executive to meet with another, electronic mail replaces telephones and sends graphic data the telephone cannot display.

- Firms with traveling sales staffs equip their salesmen with portable terminals used to send orders and receive memos from the home office.

- Firms with widely separated offices (including overseas branches) use electronic mail databases on the common carrier networks for interoffice communication.

Costs

Electronic mail is still more expensive than the USPS. According to sources for both Tymnet and CompuServe, electronic "postage" for the average message is about 50 cents, as opposed to 18 cents for first class mail. The stamp, however, is the smallest part of a letter's cost. Electronic mail could save time, labor and money com-

posing the letter with word processing.

Electronic mail, however, is not being seen as a stand-alone service in the marketplace. H. Paris Burstyn of The Yankee Group said the current office trend is towards integrated systems which offer word processing, database access, data processing and electronic filing as well as electronic mail.

A similar situation can be envisioned in the home market. The average homeowner may not be interested in investing in a microcomputer solely to have access to electronic mail. However, if he does buy a computer for other reasons electronic mail becomes a useful and easily added utility.

International Mail

The legal situation is not entirely clear, depending in part on the country. Foulger may be correct in his opinion that the Reagan administration will prevent the USPS

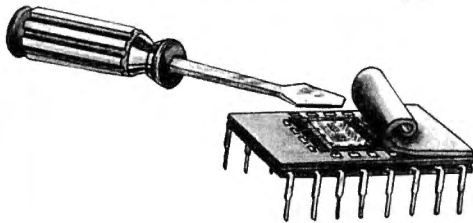
from entering the electronic mail arena. Furthermore, as Burstyn points out, the department moved too late to establish a legal monopoly on the service. Too many other companies are already in electronic mail in the United States.

In other countries the formula is different: The national telephone monopoly, often a part of the government, also runs the dominant data network. Foulger says Canada sees electronic mail as a direct threat to its postal system; the government is restricting its development.

How long can they delay the inevitable? The lengthy Canadian mail strike divided the electronic mail sheep from the goats, according to Foulger. Firms with electronic mail systems in place were not greatly hurt by the strike, but those without it had much more trouble.

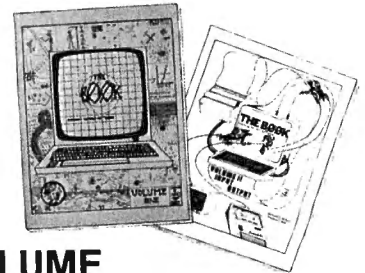
Foulger said a strike alone will not cause businesses to adopt electronic mail, mainly

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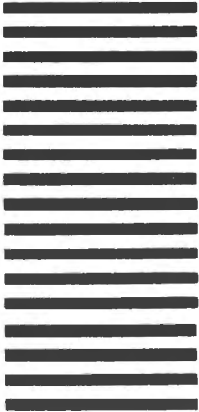
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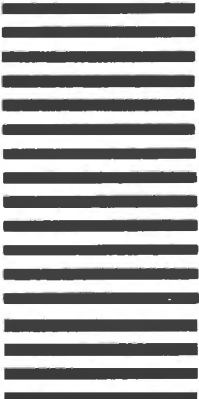
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Wayne Green, the publisher of Desktop Computing (and also of Kilobaud Microcomputing and 80 Microcomputing—both successful computing publications) has gone through both the agony and joys of working with computers. He has lost a quarter of a million on a mainframe big boy computer only to come out on the other side with all the frustration necessary to run a 200 employee publishing firm on several TRS-80's.

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31NC8

“... electronic mail is appropriate for some uses and the telephone for others; they will not really compete.”

because of the long lead time necessary to install a network (up to six months). If the business chooses the common carrier system it can get on line as quickly as it can acquire terminals. The Canadian packet network Datapac is not as well developed as packet network systems and does not reach all areas of the country.

The story is entirely different in France, where the new Socialist government is sponsoring a public experiment in home networking in a Paris suburb. At the opening, the new communications minister told reporters France is definitely in the lead in this area and intends to export equipment to the United States.

Impact

Electronic mail's impact on users is hard to assess. Certainly it will not change personal lifestyles as the telephone did in the 1920s. Electronic mail is simply another

kind of electronic communications.

The USPS and its equivalents in the other industrialized countries are obvious targets for a major impact. Most first-class mail will disappear if O'Reilly's model of electronic fund transfer comes true. Tymnet spokesman Dick Jokinen said his firm has a prototype service called TymGram allowing a single copy of a document at one end to produce multiple copies at different locations. It is a small step to electronic mass mailing.

Postal officials have read the writing on the wall. According to O'Reilly, the USPS attempt to enter the facsimile market was a bid to preserve the postal system, even at the expense of post office jobs lost to automation. If it is prevented from entering this market or if the facsimile market does not catch on with the public, the post office runs the danger of becoming the system of last resort.

The new service will probably have much less impact on telephone companies. As Baker pointed out, electronic mail is appropriate for some uses and the telephone for others; they will not really compete. Which service you use will be a matter of individual taste.

For the average user, Foulger said, the important fact is that the services are there and growing. If you are interested in learning more about them, subscribe to *The Report on Electronic Mail and Electronic Mail and Message Systems*. You might also be interested in The Yankee Group's report, *Home Electronics through 1995, Strategies for Providing Information and Control*.

Whether you decide to jump in today or wait and see what happens, whether you are an executive in a multinational corporation, a professional with a one-person office, or a homebody, electronic mail may be somewhere in your future. ■

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A Model II brings one school system out from under.

Paper Mountain

Theron Wierenga
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The public school district where I am employed has for years suffered under a paper mountain of personnel records and files. Whenever it was necessary to form a seniority list, mail out letters to teachers, list personnel by various account codes or total salaries, it took weeks to sort through the personnel files for the information.

In April, the school system I worked for was going to furnish the intermediate school district with personnel records written on special transmittal forms. A change-over to place our general ledger and payroll on their large computer was to take place in July. It became apparent that having our personnel records in a small computer of our own would be of great value for printing these transmittal forms as well as numerous other jobs. Someone is always asking for a list of special education teachers in the junior and senior high schools or some other version of the employee list. An in-house computer could also keep track of salary schedules for future projections of wage costs, along with being of real service during contract negotiations.

After much consideration, we decided that Radio Shack's Model II with 64K, a Line Printer III and two additional floppy disk drivers would do the job. The cabinet for the additional drives has an extra slot open for a third drive. With three drives future expansion should not be a problem. About 1,000 employee records needed to be stored, each taking up about 500 characters of data. It was decided that I would author all of the software, as the district's needs were peculiar to its own record keeping system

(as is often the case). The major portion of the software was written in about two months, with several months of clean-up and changes after this.

Basically, this system is designed around a set of personnel records that can be manipulated by several utility programs. A single employee's data is stored in two sectors of a disk. The employee number is the same as the record number in which the data is stored. Because a record is 256 bytes long on the TRS-80 Model II system (one sector), each employee's data is divided into two files called P1 and P2. For example, the first half of the data for employee number seven is stored in record seven of file P1 and the second half is in record seven of file P2. This gives a direct relationship between employee number and record number, allowing much faster access to records when editing a file.

The two sectors contain up to 81 different items for each employee. The item descriptors, the number of spaces allocated for each item and the necessary format (if any) can be found in Table 1.

All data that is stored in an employee's record is stored as string (ASCII) data. Numeric values must be extracted from the string data if it is needed, as with monetary amounts. Although the Model II has Basic functions for changing numeric values to strings and back again, these were not used in most of the programs. (As it turns out, in this application it becomes more bother than it's worth.) Special routines are used within the programs to do this whenever it is necessary.

There are a total of five programs used to create and manipulate the file. They are called Builder, Printer, Sorter, TMatrix and Teacher.

Builder

This program builds the employee file and allows the user to update and edit it. There are five sections: Input, where an entire employee record of 81 items can be en-

tered in order; Edit, where individual items in a record can be changed; Update, where the same item in each record can be changed; List, which gives the user a display of the item labels and Delete, where an employee's record is erased.

When entering the Input section, the computer prompts the user to enter the 81 individual items. The employee number entered must be the same as the record number displayed just before the employee number is asked for. For any item that is to be left blank, Enter can be pressed without typing any characters, and a single dash (-) will be entered for the blank item. After all 81 items are entered, the computer will store the entire record on the disk and then display the transmittal form, as entered on the screen. The user is then asked if he or she wishes to continue with the next employee record. If the answer is no the program will ask what section to enter next. If Edit is then entered, corrections or changes could be made in the record just entered.

When Builder displays a label asking the user to enter an item, a row of asterisks will appear under the label. The length of this row shows the amount of space allowed for the item. If fewer characters are typed in, the computer will fill the rest of the item with blanks. If too many characters are entered, the computer will shorten the item to the maximum length.

The Edit section asks you for the number of the employee whose record you wish to change. The second question is the item number you wish to change. After this is entered, the computer displays the entire employee record and asks for new information for the item specified, while displaying the current entry for that item. The program will continue to ask for different items to be edited until the user types in a zero to quit.

If Enter is pressed without typing a new entry in, no change will be made in the record.

The update section is similar to Edit except the program allows you to edit the

same item in every record. The program will display the entire record and the current entry for the item to be updated.

After a new item is entered, the next employee record will be displayed and then it can be updated. If you don't want to make any changes, press Enter and the item will not be changed from the current entry.

The List section of the program does not operate on the file but can be useful before using Edit or Update. When an L is typed, the computer displays all the item labels together with the item number and the number of spaces allowed for each item. The display can be frozen by pressing the Hold key. (Pressing the Hold key a second time continues writing the items on the screen.) The entire list of labels will not fit on the screen at one time.

Typing a Q(uit) will return the user to Basic.

When the Delete section is entered, the program prompts the user for the employee number of the person whose record is to be deleted. After the correction employee number is entered, all items in the record will be erased except the following:

1. Employee Number
2. Position Title
6. Name
7. Social Security Number
8. Address
9. City-State
10. Zip
11. Phone
13. Term. Date
14. Reason
75. Residency

The appropriate reason for deleting the record must be entered in item 14. Active employees will have a dash, i.e., nothing entered, for Reason. The entry is Reason is used by the Printer program to determine whether a person is an active employee or a former employee and, consequently, whether the record should be printed or not. Note: It is important to always exit Builder through the Quit command. If the break key is used instead, some data may not be writ-

	Number of Characters	Format, Etc.
Dist—County and district numbers. The computer fills this with 61010 always.		
1. Employee Number—We assign a 4 digit number which is the record number in our computer	5	XXXX
2. Position Title—A narrative description.	20	
3. Class—Type of employee	2	
4. Bldg.—Employee's work center	2	
5. Dept.—Where employee is assigned	2	
6. Name—Employee's name—last, first, initial with no punctuation	25	
7. Social Security Number—9 digits, include the two dashes	12	XXX-XX-XXXX
8. Address—Number and street	20	
9. City-State—City and State abbreviation, state in last two spaces at right	15	
10. Zip	5	
11. Phone—Home phone, include the dash	9	XXX-XXXX

Table 1. A sample of the employee transmittal form. The number of characters cannot be increased or the format changed.

ten to disk and lost.

Printer

This program is used to output the employee file, or portions of it, to the line printer. There are three options.

One option prints a complete set of employee transmittal forms. The appropriate forms are placed in the printer, and the print head is centered on the top line. Next, enter the employee number of the first and last employee to be printed. This allows you to start in the middle of the file, if necessary; a useful feature after the printer has run out of paper, for example.

Option number two prints a listing of the file with only a few basic items.

The items printed are:

1. Employee number
2. Position Title
3. Class
4. Building
6. Name
45. Total
- 58, 63, 68, 73. The 4 Contracts
- 59, 64, 69, 74. The 4 Accounts

This option also allows one to specify the first and last employee desired.

The third option prints the employee transmittal form as in option one, however,

only one employee is done at a time. This allows the user to obtain a single set of forms after a record has been edited. After the transmittal form has been printed, the program asks for another employee number. Additional forms can be obtained, or by typing a zero, the program will quit. If the user wishes to have the printer discontinue immediately, the Break key can be pressed.

Before Printer begins to output the employee records, the user is asked, "Should former employee's records be printed?" If the response is yes, then all records in the file are printed. If no is the response, then only those records that have a "-" for Reason (item 14) will be printed. Item 14 should be changed to the appropriate Reason code whenever an employee's record is deleted in Builder.

Sorter

The program is a general purpose sort and print routine. It has several features: an unlimited number of keys, partial keys, And... Or function, four types of printout, seven items that can be summed, and the printout can be ordered or alphabetized by a given item.

At the beginning of the program you are taken through a series of questions to de-



Photo 1

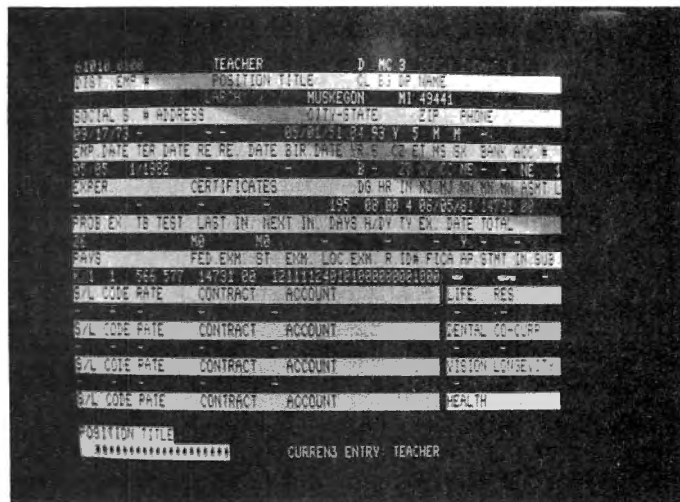


Photo 2

"We want a minimal printout of all teachers who reside in the district."

termine what type of a sort will be done on the file and what kind of printout is desired. As an example, consider the following sort through the file. We want a minimal printout of all teachers that are at the high school who are residents of the district. This will be an And sort because the person must be a teacher *and* a high school employee *and* a resident. We will not sum any items, but we want the list alphabetized by name.

The questions asked are as follows:

- How many keys?—you must respond with the number of different items that will be used to perform the search. In our example this would be three: teachers, high school employee and resident.
- Enter item number for key#—at this point you enter the item number for the three keys. They would be 3, 4 and 75.
- Do you wish a partial key?—In this case no. A partial key is used only when a portion of an item is being searched for. An example of this might be a particular three numbers in the middle of one of the account numbers.
- Enter position of first character, number of characters and the exact Key—this sec-

tion prompts the user for the partial key if one was chosen. Three values must be typed in, separated by commas. The first value is the numerical position of the first character of the partial key. The second value is the number of characters in the partial key, and the third value is the partial key itself. An example would be 4, 2, AB, meaning the fourth character in the item is the first character in the key. The key is two characters long and the exact key is AB.

- Enter exact key for_____—if a partial key is not chosen, this message prompts you for the exact key to be compared with the entire item. An error message will occur if the key typed in is longer than the number of characters used for the item. If the key typed in is shorter than the full number of characters used for the item, the program fills extra spaces with blanks to the right.
- Is this an And or Or sort?—this input allows the user to choose two different types of sort. An And sort is when all of the various keys must match the items in an employee record before that record will be printed. The Or sort will print the record if one or more of the various keys match the

items in the employee record.

- What type of printout do you desire?—there are four possible types of printout:

A minimal listing of employees that includes the employee number, position title, class, building, name, total and the four contracts amounts and the account numbers. This printout takes four lines for each employee.

A printout of the entire record in a style very similar to the employee transmittal form, but instead it is printed on regular blank paper.

A mailing label that contains only the name and address of the employee. Single width, pre-gummed labels, with a six line spacing from label to label, must be placed in the printer.

A printout that consists of a list of desired items that the user has specified. If this option is chosen the program asks, "How many items do you want printed for each match?" This can be any value up to 80. The program then asks you to Enter item #—to be printed. The



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"The program prints a complete new salary schedule from one to 13 years..."

list of item numbers for the desired print-out is then entered. Users should always enter several items that will easily identify the employee when a match is found. Examples would be the employee number, name, class, building, etc. If a large number of items are requested the user should keep in mind that they will be printed across the line in the order they were entered. If the length of the requested items exceeds the width as specified by the Forms statement the printer will continue on the next line.

● Do you wish to have any items summed?—there are a total of seven items in the employee's record that may be summed as the individual employees are found in the sort. These items are the Total (item 45), the four Contract amounts (items 58, 63, 68, 73), the C—curricular percentage (item 76) and the Longevity amount (item 81).

If you wish to have items summed, the program will first ask, for "How many items?" and then ask the user to Enter the item number. If more than seven items are asked to be summed, the program will ask, "How many items?" again. The program also checks to see if the items entered are valid ones for summation. If the item is invalid, the program asks for the item number to be entered again.

● Do you want the printout to be alphabetized or ordered?—if no order is needed the program will simply print out the employee records as matches to keys found, and the order will be by employee number. If something like a printout in alphabet order by employee name is desired, Y should be answered. The program then asks the user to Enter the item that the printout will be alphabetized or ordered by. A 6 should be entered if alphabetizing by employee name is desired. Other item numbers will produce an ordered printout based on that particular item. This allows you to print sorted records by building number, class, years of service, etc.

TMatrix

This program must be run to calculate the number of employees on each step and level of the salary schedule. Once run, the program Teacher will use the data file that

TMatrix produces and stores on the disk.

TMatrix does a limited sort on the four account codes and also allows the user to choose the class code (Item 3). The questions the user is prompted with are as follows:

● Enter the file name for the matrix—the user should enter a name for the matrix that is six characters or less. This same name must be used when running Teacher.

● Is this an And or Or sort?—an And sort is when all keys must match the employee's record and an Or sort is when only one or more keys must match.

● How many keys for the account codes?—enter the number of keys there will be in the search.

● Enter item number, position of first character, number of characters and the exact key for each account number desired—the valid item numbers are 59, 64, 69, and 74. The next three values are the position of the first character of the partial key, the number of characters in the key, and the key itself. The four values are all typed on one line, separated by commas. This is similar to a prompt in Sorter, but the item number for the account code must also be included.

The current record number being read is displayed on the screen as the search continues. When the search is finished the matrix is printed along with a separate matrix for the longevity schedule.

Teacher

This program computes a new teacher salary schedule using the amount of the current base salary and the percent increase for the new schedule. Upon entry into the program the following questions are asked.

● Enter the file name of the matrix you wish to use—a file name that was created by the use of the TMatrix program should be entered. Various matrices can be stored and used depending upon the employee group desired.

● Enter current base and percent increase—the current base salary and the percentage increase (in whole number percents, for example 7.5 for 7.5 percent) should be entered.

● If projections are to be on next year's matrix Enter A 1, if on this year's Enter A 0—if a

1 is entered, each employee will be entered into the matrix on the next year's step. This allows the user to project the cost of next year's salary schedule. The program will print a complete new salary schedule from one to 13 years by half year steps and from 14 to 40 years by yearly steps.

After the new schedule is computed, the program uses the data file produced by TMatrix to find the total amount of teacher salaries for each step and level of the salary schedule. A printout of this follows in which each step is subtotaled and a projected total of all teacher salaries is arrived at. A separate schedule for the longevity totals is also printed in the same format.

Although the programs shown and described here are structured for the employee file at a particular public school system, the basic structure can be used for the employee file of any company or public institution. Actually, very few changes would have to be made in the three main programs Builder, Printer and Sorter. The salary schedule projection programs TMatrix and Teacher would have to be rewritten extensively.

Changes

The number of items (NUM), item labels, and the number of characters in the data statement would need to be changed. The format of the printout on the video display in Builder and printing in Printer and Sorter will need complete changing to reflect the items each employee record has. The Dim statement and the Open and Field statements will need to be changed depending on the number of items and characters in each record. Along with this, a few constants in the program will have to be changed, for example the value 254 (which is a record length) in several formulas. The specific items deleted in Builder and summed in Sorter will have to be changed to meet individual needs.

Very little work was done on these programs in terms of optimizing them for speed. In spite of this, they run fairly quickly for a microcomputer that is reading and writing to disks. The total time to run Sorter given roughly 1,000 employee records, multiple keys and alphabetizing the output is under one hour. ■

Program Listing 1

```
100 REM - BUILDER - This program builds the employee file and allows one to
120 REM to update and edit it. There are five sections: Input, where an entire record is entered; Edit, where items in
140 REM a record can be changed and Update, where the same item
160 REM in each record can be changed. There is also a List option
180 REM where a listing of the labels can be obtained on the
200 REM screen; and a Delete function that will erase a record.
220 REM Written by Theron Wieren9a during March 1980.
240 REM
```

Program Listing 1 continues

Program Listing 1 continued

```

260 CLEAR 2000
280 DIM L$(90),L1(90),F$(90)
300 REM - READ IN DATA
320 NUM=81
340 FOR I=1 TO NUM
360 READ L$(I),L1(I)
380 DATA EMPLOYEE #,5,POSITION TITLE,20,CLASS,2,BUILDING,2,DEPARTMENT,2,NAME,25,SOCIAL SECURITY #,12,ADDRESS
400 DATA 20,CITY-STATE,15,ZIP,5,PHONE,9,EMPLOY DATE,8,TERM. DATE,8,REASON,1,RE-EMPLOY DATE,8,BIRTH DATE,8
420 DATA YRS. SERVICE,5,CITIZEN,1,ETHNIC,1,MARITAL STATUS,1,SEX,1,BANK ACCOUNT #,10,EXPERIENCE,5
440 DATA CERTIFICATE 1,6,CERTIFICATE 2,6,CERTIFICATE 3,6,DEGREE,1,HOURS,3,INSTITUTION,2,MAJOR 1,2,MAJOR 2,2
460 DATA MINOR 1,2,MINOR 2,2,MINOR 3,2,ASSIGNMENT,4,LEVEL,1,PROB. EXPR. DATE,8,LAST TB TEST,8
480 DATA LAST INCREASE,8,NEXT INCREASE,8,DAYS,4,HRS./DAY,5,TYPE,1,EXPR. DATE,8
500 DATA TOTAL,9,PAYS,2,FED. EXEMP.,7,STATE EXEMP.,7,LOCAL EXEMP.,7,RET. ID #,5,FICA EX.,1,AUTO PAY,1
520 DATA STMT,1,INS. SUBSIDY,7,STEP/LEVEL 1,3,CODE 1,1,RATE 1,8,CONTRACT 1,9,ACCOUNT 1,24,STEP/LEVEL 2,3,CODE
,1
540 DATA RATE 2,8,CONTRACT 2,9,ACCOUNT 2,24,STEP/LEVEL 3,3,CODE 3,1,RATE 3,8,CONTRACT 3,9,ACCOUNT 3,24,STEP/LE
EL 4,3,CODE 4,1
560 DATA RATE 4,8,CONTRACT 4,9,ACCOUNT 4,24,RESIDENCY,1,CO-CURR. %,5,LIFE INS.,1,DENTAL INS.,1,VISION INS.,1
580 DATA HEALTH INS.,4,LONGEVITY,4
600 NEXT I
620 OPEN "D",1,"P1",254
640 FIELD 1,254 AS A1$
660 OPEN "D",2,"P2",253
680 FIELD 2,253 AS A2$
700 GOSUB 2100
720 IF G$="I" THEN 1260
740 IF G$="U" THEN 1820
760 IF G$="L" THEN 4000
780 IF G$="D" THEN 4220
800 REM*****
820 REM - EDIT A RECORD
840 PRINT"INPUT EMPLOYEE NUMBER - ENTER 0 (ZERO) TO QUIT"
860 S=-1
880 INPUT S
900 IF S=0 THEN 700
920 IF S>0 AND S<=LOF(1) THEN 980
940 PRINT"BAD EMPLOYEE NUMBER":PRINT
960 GOTO 840
980 GET 1,S
1000 GET 2,S
1020 PRINT:PRINT
1040 PRINT"WHICH ITEM - ENTER 0 (ZERO) TO QUIT"
1060 I=-1
1080 INPUT I
1100 IF I=0 THEN 700
1120 IF I>0 AND I<=NUM THEN 1180
1140 PRINT"INVALID ITEM NUMBER - TRY AGAIN"
1160 GOTO 1020
1180 GOSUB 3300
1200 GOSUB 2320
1220 GOTO 1020
1240 REM*****
1260 REM - INPUT ENTIRE FILES
1280 H$="-"
1300 R=LOF(1)
1320 R=R+1
1340 PRINT"NEXT RECORD NUMBER IS";R
1360 D$="":E$=""
1380 FOR I=1 TO NUM
1400 GOSUB 2040
1420 PRINT
1440 GOSUB 3040
1460 IF I>42 THEN 1520
1480 D$=D$+C$
1500 GOTO 1540
1520 E$=E$+C$
1540 NEXT I
1560 LSET A1$=D$
1580 PUT 1,R
1600 LSET A2$=E$
1620 PUT 2,R
1640 GOSUB 3300
1660 PRINT:PRINT
1680 PRINT"CONTINUE (Y OR N)";
1700 INPUT G$
1720 IF G$="Y" THEN 1320
1740 IF G$="N" THEN 700
1760 GOTO 1680
1780 REM*****
1800 REM - UPDATE A SINGLE ITEM IN ALL FILES
1820 PRINT"INPUT ITEM NUMBER TO BE UPDATED IN ALL RECORDS"
1840 I=0
1860 INPUT I
1880 IF I>0 AND I<=NUM THEN 1940
1900 PRINT"INVALID ITEM NUMBER - TRY AGAIN"
1920 GOTO 1820
1940 FOR S=1 TO LOF(1)
1960 GET 1,S
1980 GET 2,S
2000 GOSUB 3300
2020 GOSUB 2320
2040 NEXT S
2060 GOTO 700
2080 REM*****
2100 PRINT:PRINT"INPUT WHOLE RECORDS, EDIT, UPDATE, DELETE, LIST LABELS OR QUIT"

```

Program Listing 1 continues

Program Listing 1 continued

```

2120 PRINT"ENTER I, E, U, L, D OR Q"
2140 G$=".,->."
2160 INPUT G$
2180 IF G$=".,->." THEN 2100
2200 IF G$="I" OR G$="E" OR G$="U" OR G$="L" OR G$="D" THEN 2280
2220 IF G$(">")="Q" THEN 2100
2240 CLOSE 1,2
2260 STOP
2280 RETURN
2300 REM*****
2320 REM - INPUT AND UPDATE AN ITEM
2340 D$=A1$:E$=A2$
2360 T=0
2380 IF I=1 THEN 2460
2400 FOR J=1 TO I-1
2420 T=T+L1(J)
2440 NEXT J
2460 GOSUB 2840
2480 PRINT TAB(L1(I)+10);"CURRENT ENTRY: ";
2500 IF I>42 THEN 2580
2520 H$=MID$(D$,T+1,L1(I))
2540 PRINT H$
2560 GOTO 2620
2580 H$=MID$(E$,T+1-254,L1(I))
2600 PRINT H$
2620 GOSUB 3040
2640 IF I>42 THEN 2700
2660 MID$(D$,T+1,L1(I))=C$
2680 GOTO 2720
2700 MID$(E$,T+1-254,L1(I))=C$
2720 LSET A1$=D$
2740 LSET A2$=E$
2760 PUT 1,S
2780 PUT 2,S
2800 RETURN
2820 REM*****
2840 REM - PRINT OUT LABEL
2860 PRINT:PRINT CHR$(26);
2880 PRINT L$(I)
2900 PRINT" ";
2920 FOR I2=1 TO L1(I)
2940 PRINT"*";
2960 NEXT I2
2980 PRINT CHR$(25);
3000 RETURN
3020 REM*****
3040 REM - FILL IN C$ WITH BLANKS
3060 C$=".,->."
3080 INPUT C$
3100 IF C$(">")=".,->." THEN 3140
3120 C$=H$
3140 Z=LEN(C$)
3160 IF Z<=L1(I) THEN 3220
3180 C$=LEFT$(C$,L1(I))
3200 GOTO 3260
3220 IF Z=L1(I) THEN 3260
3240 C$=C$+SPACE$(L1(I)-Z)
3260 RETURN
3280 REM*****
3300 REM - PRINT TRANSMITTAL FORM ON VIDEO SCREEN
3320 PRINT:PRINT
3340 T=1
3360 FOR J=1 TO 42
3380 F$(J)=MID$(A1$,T,L1(J))
3400 T=T+L1(J)
3420 NEXT J
3440 T=1
3460 FOR J=43 TO NUM
3480 F$(J)=MID$(A2$,T,L1(J))
3500 T=T+L1(J)
3520 NEXT J
3540 PRINT"61010 ";F$(1);SPACE$(9);F$(2);F$(3);" ";F$(4);" ";F$(5);" ";F$(6)
3560 PRINTCHR$(26);"DIST EMP # POSITION TITLE CL BG DP NAME ";CHR$(25)
3580 PRINT F$(7);F$(8);" ";F$(9);" ";F$(10);" ";F$(11)
3600 PRINTCHR$(26);"SOCIAL S. # ADDRESS CITY-STATE ZIP PHONE ";CHR$(25)
3620 PRINT F$(12);" ";F$(13);" ";F$(14);" ";F$(15);" ";F$(16);" ";F$(17);" ";F$(18);" ";F$(19);" ";F$(20);"
";F$(21);" ";F$(2)
2)
3640 PRINTCHR$(26);"EMP.DATE TER.DATE RE RE. DATE BIR.DATE YR.S CZ ET MS SX BANK ACC.# ";CHR$(25)
3660 PRINT F$(23);" ";F$(24);" ";F$(25);" ";F$(26);" ";F$(27);" ";F$(28);" ";F$(29);" ";F$(30);"
";F$(31);" ";F$(32);"
";F$(33);" ";F$(34);" ";F$(35);" ";F$(36)
3680 PRINTCHR$(26);"EXPER. CERTIFICATES DG HR IN MJ MJ MN MN MN ASMT L";CHR$(25)
3700 PRINT F$(37);" ";F$(38);" ";F$(39);" ";F$(40);" ";F$(41);" ";F$(42);" ";F$(43);" ";F$(44);" ";F$(45)
3720 PRINTCHR$(26);"PROB.EX. TB TEST LAST IN. NEXT IN. DAYS H/DY TY EX. DATE TOTAL ";CHR$(25)
3740 PRINT F$(46);SPACE$(15);F$(47);" ";F$(48);" ";F$(49);" ";F$(50);" ";F$(51);" ";F$(52);" ";F$(53);"
";F$(54)
3760 PRINTCHR$(26);"PAYS FED.EXM. ST. EXM. LOC.EXM. R.ID# FICA AP STMT IN.SUB.";CHR$(25)
3780 PRINT F$(55);" ";F$(56);" ";F$(57);" ";F$(58);" ";F$(59);" ";F$(77);" ";F$(75)
3800 PRINTCHR$(26);"S/L CODE RATE CONTRACT ACCOUNT ";CHR$(25);" ";CHR$(26);"LIFE RES.
";CHR$(25)
3820 PRINT F$(60);" ";F$(61);" ";F$(62);" ";F$(63);" ";F$(64);" ";F$(78);" ";F$(76)
3840 PRINTCHR$(26);"S/L CODE RATE CONTRACT ACCOUNT ";CHR$(25);" ";CHR$(26);"DENTAL CO-CUR

```

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Program Listing 1 continued

```

.   ;CHR$(25)
3860 PRINT F$(65);"   ";F$(66);"   ";F$(67);"   ";F$(68);"   ";F$(69);"   ";F$(70);"   ";F$(71);"   ";F$(72);"   ";F$(73);"   ";F$(74);"   ";F$(75);"   ";F$(76);"   ";F$(77);"   ";F$(78);"   ";F$(79);"   ";F$(80);"   ";F$(81);"   ";F$(82);"   ";F$(83);"   ";F$(84);"   ";F$(85);"   ";F$(86);"   ";F$(87);"   ";F$(88);"   ";F$(89);"   ";F$(90);"   ";F$(91);"   ";F$(92);"   ";F$(93);"   ";F$(94);"   ";F$(95);"   ";F$(96);"   ";F$(97);"   ";F$(98);"   ";F$(99);"   ";F$(100);"
3880 PRINTCHR$(26);"S/L CODE RATE      CONTRACT      ACCOUNT      ";CHR$(25);"   ";CHR$(26);"VISION LONGEV

TY   ;CHR$(25)
3900 PRINT F$(70);"   ";F$(71);"   ";F$(72);"   ";F$(73);"   ";F$(74);"   ";F$(75);"   ";F$(76);"   ";F$(77);"   ";F$(78);"   ";F$(79);"   ";F$(80);"   ";F$(81);"   ";F$(82);"   ";F$(83);"   ";F$(84);"   ";F$(85);"   ";F$(86);"   ";F$(87);"   ";F$(88);"   ";F$(89);"   ";F$(90);"   ";F$(91);"   ";F$(92);"   ";F$(93);"   ";F$(94);"   ";F$(95);"   ";F$(96);"   ";F$(97);"   ";F$(98);"   ";F$(99);"   ";F$(100);"
3920 PRINTCHR$(26);"S/L CODE RATE      CONTRACT      ACCOUNT      ";CHR$(25);"   ";CHR$(26);"HEALTH

   ;CHR$(25)
3940 RETURN
3960 REM*****
3980 REM - LIST OUT THE LABELS ON THE SCREEN
4000 J=1
4020 FOR I=1 TO NUM
4040 PRINT TAB(J);I;L$(I);" - ";L1(I);" SPACES";
4060 J=J+40
4080 IF J<50 THEN 4140
4100 PRINT
4120 J=1
4140 NEXT I
4160 PRINT
4180 GOTO 700
4200 REM*****
4220 REM - DELETE A RECORD
4240 R=-1
4260 PRINT"ENTER THE NUMBER OF THE EMPLOYEE THAT YOU WISH TO DELETE"
4280 INPUT"ENTER A 0 (ZERO) TO QUIT";R
4300 IF R=0 THEN 700
4320 IF R>0 AND R<=LOF(1) THEN 4380
4340 PRINT"BAD EMPLOYEE NUMBER - TRY AGAIN"
4360 GOTO 4240
4380 D$="" ;E$="" ;H$="" ;T=0
4400 GET 1,R:GET 2,R
4420 FOR I=1 TO NUM
4440 IF I=1 THEN 4480
4460 T=T+L1(I-1)
4480 GOSUB 3120
4500 IF I=1 OR I=2 OR I=13 OR I=14 THEN GOSUB 4780
4520 IF I>5 AND I<12 THEN GOSUB 4780
4540 IF I=75 THEN GOSUB 4820
4560 IF I>42 THEN 4620
4580 D$=D$+C$
4600 GOTO 4640
4620 E$=E$+C$
4640 NEXT I
4660 LSET A1$=D$
4680 LSET A2$=E$
4700 PUT 1,R:PUT 2,R
4720 GOSUB 3320
4740 PRINT
4760 GOTO 4240
4780 C$=MID$(A1$,T+1,L1(I))
4800 RETURN
4820 C$=MID$(A2$,T+1-254,L1(I))
4840 RETURN
4860 REM*****END OF PROGRAM*****

```

Program Listing 2

```

100 REM - PRINTER - This program prints out the entire file as either a list
120 REM                  with basic information or on the Employee Transmittal
140 REM                  Forms. Single Transmittal Forms can also be produced.
160 REM                  Written by Theron Wierenga during March 1980.
180 CLEAR 2000
200 DIM L1(90),F$(90)
220 OPEN "D",1,"P1",254
240 FIELD 1,254 AS A1$
260 OPEN "D",2,"P2",253
280 FIELD 2,253 AS A2$
300 REM*****
320 REM - READ IN DATA
340 NUM=B1
360 FOR I=1 TO NUM
380 READ L1(I)
400 DATA5,20,2,2,2,25,12,20,15,5,9,8,8,1,8,8,5,1,1,1,1,10,5,6,6,6,1,3,2,2,2,2
420 DATA2,4,1,8,8,8,8,4,5,1,8,9,2,7,7,5,1,1,1,7,3,1,8,9,24,3,1,8,9,24,3,1,8,9
440 DATA24,3,1,8,9,24,1,5,1,1,1,4,4
460 NEXT I
480 INPUT"SHOULD FORMER EMPLOYEE'S RECORDS BE PRINTED (Y OR N)";G$
500 IF G$="Y" OR G$="N" THEN 540
520 GOTO 480
540 PRINT"WHAT TYPE OF PRINTOUT IS DESIRED ?"
560 PRINT"      1. Complete set of records on the Employee Transmittal Forms."
580 PRINT"      2. List of employees with basic information."
600 PRINT"      3. A single Employee Transmittal Form at a time."
620 INPUT Z$
640 IF Z$="1" THEN 1540
660 IF Z$="2" THEN 1080
680 IF Z$="3" THEN 760
700 GOTO 540
720 REM*****
740 REM - PRINT SINGLE TRANSMITTAL FORM
760 PRINT"Be sure that Transmittal Forms are aligned in the printer."

```


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Program Listing 2 continued

```

780 PRINT
800 INPUT"Enter Employee Number or 0 (Zero) to quit.":R
820 IF R=0 THEN 1820
840 IF R>0 AND R<=LOF(1) THEN 900
860 PRINT"BAD EMPLOYEE NUMBER - TRY AGAIN"
880 GOTO 800
900 GET 1,R
920 GET 2,R
940 GOSUB 1960
960 IF G$="Y" THEN 1020
980 IF F$(14)<>"-" THEN PRINT"FORMER EMPLOYEE"
1000 IF F$(14)<>"-" THEN 800
1020 GOSUB 2240
1040 GOTO 800
1060 REM*****
1080 REM - PRINT OUT LIST WITH BASIC INFORMATION
1100 PRINT"-----"
1120 PRINT" *** WIDTH MUST BE SET TO 100 CHARACTERS MINIMUM ON THE PRINTER *** "
1140 PRINT"-----"
1160 PRINT:PRINT"ALIGN PAPER TO TOP OF PAGE --- THEN"
1180 PRINT:INPUT THE FIRST AND LAST EMPLOYEE NUMBER DESIRED"
1200 PRINT"EXAMPLES: 1,999 OR 256,512"
1220 INPUT F1,F2
1240 LPRINT CHR$(31);DATE$;" ";TIME$;CHR$(30):LPRINT
1260 REM - HEADING HERE
1280 FOR R=F1 TO F2
1300 GET 1,R
1320 GET 2,R
1340 GOSUB 1960
1360 IF G$="Y" THEN 1400
1380 IF F$(14)<>"-" THEN 1480
1400 LPRINT F$(1);" ";F$(2);" ";F$(3);" ";F$(4);" ";F$(6);" ";F$(45);" ";F$(58);" ";F$(59)
1420 LPRINT TAB(69);F$(63);" ";F$(64)
1440 LPRINT TAB(69);F$(68);" ";F$(69)
1460 LPRINT TAB(69);F$(73);" ";F$(74)
1480 NEXT R
1500 GOTO 1820
1520 REM*****
1540 REM - PRINT SET OF EMPLOYEE TRANSMITTAL FORMS"
1560 PRINT"ALIGN TRANSMITTAL FORMS IN THE PRINTER --- THEN"
1580 PRINT:INPUT THE FIRST AND LAST EMPLOYEE NUMBER DESIRED"
1600 PRINT"EXAMPLES: 1,999 OR 256,512"
1620 INPUT F1,F2
1640 FOR R=F1 TO F2
1660 GET 1,R
1680 GET 2,R
1700 GOSUB 1960
1720 IF G$="Y" THEN 1760
1740 IF F$(14)<>"-" THEN 1780
1760 GOSUB 2240
1780 NEXT R
1800 REM*****
1820 REM - ADVANCE PAPER AND STOP
1840 FOR I=1 TO 20
1860 LPRINT
1880 NEXT I
1900 CLOSE 1,2
1920 STOP
1940 REM*****
1960 REM - BREAK DOWN THE RECORD INTO ITS PARTS
1980 T=1
2000 FOR J=1 TO 42
2020 F$(J)=MID$(A1$,T,L1(J))
2040 T=T+L1(J)
2060 NEXT J
2080 T=1
2100 FOR J=43 TO NUM
2120 F$(J)=MID$(A2$,T,L1(J))
2140 T=T+L1(J)
2160 NEXT J
2180 RETURN
2200 REM*****
2220 REM - PRINT ENTIRE RECORD ON FORMS
2240 LPRINT"61010 ";F$(1);SPACE$(9);F$(2);F$(3);" ";F$(4);" "F$(5);" ";F$(6)
2260 LPRINT:LPRINT
2280 LPRINT F$(7);" ";F$(8);" ";F$(9);" ";F$(10);" ";F$(11)
2300 LPRINT:LPRINT
2320 LPRINT F$(12);" ";F$(13);" ";F$(14);" ";F$(15);" ";F$(16);" ";F$(17);" ";F$(18);" ";F$(19);" ";F$(20)
";" ";F$(21);" ";
F$(22)
2340 LPRINT:LPRINT SPACE$(64);LEFT$(F$(35),2)
2360 LPRINT F$(23);" ";F$(24);" ";F$(25);" ";F$(26);" ";F$(27);" ";F$(28);" ";F$(29);" ";F$(30);"
";F$(31);" ";F$(32);
" ";F$(33);" ";F$(34);" ";RIGHT$(F$(35),2);" ";F$(36)
2380 LPRINT:LPRINT
2400 LPRINT F$(37);" ";F$(38);" ";F$(39);" ";F$(40);" ";F$(41);" ";F$(42);" ";F$(43);" ";F$(44);" ";F$(45)
2420 LPRINT:LPRINT:LPRINT
2440 LPRINT F$(46);SPACE$(16);F$(47);" ";F$(48);" ";F$(49);" ";F$(50);" ";F$(51);" ";F$(52);" ";F$(53);
";F$(54)
2460 LPRINT:LPRINT
2480 LPRINT SPACE$(40);"RES";F$(75);" CO-CUR";F$(76);" LONG";F$(81):LPRINT
2500 LPRINT F$(55);" ";F$(56);" ";F$(57);" ";F$(58);" ";F$(59);" LIFE ";F$(77)

```

Program Listing 2 continues

Program Listing 2 continued

```

2520 LPRINT
2540 LPRINT F$(60);" ";F$(61);" ";F$(62);" ";F$(63);" ";F$(64);"          DENTAL ";F$(78)
2560 LPRINT
2580 LPRINT F$(65);" ";F$(66);" ";F$(67);" ";F$(68);" ";F$(69);"          VISION ";F$(79)
2600 LPRINT
2620 LPRINT F$(70);" ";F$(71);" ";F$(72);" ";F$(73);" ";F$(74);"          HEALTH ";F$(80)
2640 LPRINT:LPRINT
2660 RETURN
2680 REM*****END OF PROGRAM*****

```

Program Listing 3

```

100 REM - SORTER - This program is a General Purpose sort and Print routine.
120 REM           Its features are: An unlimited number of keys; partial keys;
140 REM           AND/OR function for the sort; four types of printout; seven
160 REM           items can be summed and the printout can be ordered or
180 REM           alphabetized.
200 REM           Written by Theron Wierenga during March 1980.
220 CLEAR 10000
240 DIM L$(90),L1(90),F$(90),Y(100),E1(100),E2(100),K$(100),W1(1000),W2$(1000)
260 DIM P4(80)
280 REM*****
300 REM - READ IN DATA
320 NUM=81
340 FOR I=1 TO NUM
360 READ L$(I),L1(I)
380 DATA EMPLOYEE #,5,POSITION TITLE,20,CLASS,2,BUILDING,2,DEPARTMENT,2,NAME,25,SOCIAL SECURITY #,12,ADDRESS
400 DATA 20,CITY-STATE,15,ZIP,5,PHONE,9,EMPLOY DATE,8,TERM. DATE,8,REASON,1,RE-EMPLOY DATE,8,BIRTH DATE,8
420 DATA YRS. SERVICE,5,CITIZEN,1,ETHNIC,1,MARITAL STATUS,1,SEX,1,BANK ACCOUNT #,10,EXPERIENCE,5
440 DATA CERTIFICATE 1,6,CERTIFICATE 2,6,CERTIFICATE 3,6,DEGREE,1,HOURS,3,INSTITUTION,2,MAJOR 1,2,MAJOR 2,2
460 DATA MINOR 1,2,MINOR 2,2,MINOR 3,2,ASSIGNMENT,4,LEVEL,1,PROB. EXPR. DATE,8,LAST TB TEST,8
480 DATA LAST INCREASE,8,NEXT INCREASE,8,DAYS,4,HRS./DAY,5,TYPE,1,EXPR. DATE,8
500 DATA TOTAL,9,PAYS,2,FED. EXEMP.,7,STATE EXEMP.,7,LOCAL EXEMP.,7,RET. ID #,5,FICA EX.,1,AUTO PAY,1
520 DATA STMT,1,INS. SUBSIDY,7,STEP/LEVEL,3,CODE,1,RATE,8,CONTRACT,9,ACCOUNT,24,STEP/LEVEL,3,CODE,1
540 DATA RATE,8,CONTRACT,9,ACCOUNT,24,STEP/LEVEL,3,CODE,1,RATE,8,CONTRACT,9,ACCOUNT,24,STEP/LEVEL,3,CODE,1
560 DATA RATE,8,CONTRACT,9,ACCOUNT,24,RESIDENCY,1,CO-CURR. %,5,LIFE INS.,1,DENTAL INS.,1,VISION INS.,1
580 DATA HEALTH INS.,4,LONGEVITY,4
600 NEXT I
620 FOR I=1 TO 7
640 READ S2(I)
660 DATA 45,59,64,69,74,76,81
680 NEXT I
700 FOR I=0 TO 9
720 READ S3$(I)
740 DATA 0,1,2,3,4,5,6,7,8,9
760 NEXT I
780 OPEN "D",1,"P1",254
800 FIELD 1,254 AS A1$
820 OPEN "D",2,"P2",253
840 FIELD 2,253 AS A2$
860 REM*****
880 REM - SET UP THE QUALIFIERS
900 INPUT"HOW MANY KEYS";X
920 IF X<1 OR X>100 THEN 900
940 FOR I=1 TO X
960 PRINT"ENTER ITEM NUMBER FOR KEY #";I;
980 INPUT Y(I)
1000 IF Y(I)>0 AND Y(I)<=NUM THEN 1060
1020 PRINT"INVALID ITEM NUMBER - TRY AGAIN"
1040 GOTO 960
1060 INPUT"DO YOU WISH A PARTIAL KEY (Y OR N)";E$
1080 IF E$="Y" THEN 1140
1100 IF E$="N" THEN 1300
1120 GOTO 1060
1140 PRINT"ENTER POSITION OF 1ST CHARACTER; NUMBER OF CHARACTERS"
1160 PRINT"AND THE EXACT KEY FOR ";L$(Y(I));". EXAMPLE: 4,2,AB WHICH MEANS START"
1180 PRINT"LOOKING AT THE 4TH CHARACTER; THE KEY IS 2 CHARACTERS"
1200 PRINT"LONG AND THE KEY IS AB."
1220 K$(I)=".→."
1240 INPUT E1(I),E2(I),K$(I)
1260 IF K$(I)=".→." THEN 1140
1280 GOTO 1500
1300 PRINT"ENTER EXACT KEY FOR ";L$(Y(I));
1320 K$(I)=".→."
1340 INPUT K$(I)
1360 IF K$(I)=".→." THEN 1300
1380 Z=LEN(K$(I))
1400 IF Z<=L1(Y(I)) THEN 1460
1420 PRINT"THE KEY IS TOO LONG"
1440 GOTO 1300
1460 IF Z=L1(Y(I)) THEN 1500
1480 K$(I)=K$(I)+SPACE$(L1(Y(I))-Z)
1500 NEXT I
1520 REM*****
1540 REM - IS AN AND/OR SORT
1560 INPUT"IS THIS AN 'AND' OR 'OR' SORT";G2$
1580 IF G2$="AND" THEN 1640
1600 IF G2$="OR" THEN 1680
1620 GOTO 1560
1640 P3=1
1660 GOTO 1740
1680 P3=2
1700 REM*****

```

Program Listing 3 continues

Program Listing 3 continued

```

1720 REM - DETERMINE THE TYPE OF PRINTOUT
1740 PRINT "WHAT TYPE OF PRINTOUT DO YOU DESIRE ?"
1760 PRINT "    1. Minimal printout for each match."
1780 PRINT "    2. Entire record for each match."
1800 PRINT "    3. A mailing label for each match."
1820 PRINT "    4. Print only specific items requested."
1840 INPUT P1
1860 IF P1=1 OR P1=2 OR P1=3 THEN 2060
1880 IF P1<>4 THEN 1740
1900 INPUT "HOW MANY ITEMS DO YOU WANT PRINTED FOR EACH MATCH";P2
1920 FOR I=1 TO P2
1940 PRINT "ENTER ITEM #";I;" TO BE PRINTED";
1960 INPUT P4(I)
1980 IF P4(I)<1 OR P4(I)>NUM THEN 1940
2000 NEXT I
2020 REM*****
2040 REM - ARE ANY ITEMS SUMMED ?
2060 INPUT "DO YOU WISH TO HAVE ANY ITEMS SUMMED (Y OR N)";G$
2080 IF G$="Y" THEN 2140
2100 IF G$="N" THEN 2400
2120 GOTO 2060
2140 INPUT "HOW MANY ITEMS";N
2160 IF N>0 AND N<=7 THEN 2220
2180 PRINT "ONLY SEVEN ITEMS CAN BE SUMMED - ENTER AGAIN"
2200 GOTO 2140
2220 FOR I=1 TO N
2240 INPUT "ENTER THE ITEM NUMBER";S(I)
2260 FOR J=1 TO 7
2280 IF S2(J)=S(I) THEN 2360
2300 NEXT J
2320 PRINT "INVALID ITEM NUMBER FOR SUMMATION - ENTER AGAIN"
2340 GOTO 2240
2360 NEXT I
2380 REM*****
2400 REM - ALPHABETIZE OR ORDER THE PRINTOUT ?
2420 INPUT "DO YOU WANT THE PRINTOUT TO BE ALPHABETIZED OR ORDERED (Y OR N)";O$
2440 IF O$="Y" THEN 2500
2460 IF O$="N" THEN 2620
2480 GOTO 2420
2500 INPUT "ENTER ITEM THAT THE PRINTOUT WILL BE ALPHABETIZED OR ORDERED BY";O1
2520 IF O1>0 AND O1<=NUM THEN 2620
2540 PRINT "INVALID ITEM NUMBER - TRY AGAIN"
2560 GOTO 2500
2580 REM*****
2600 REM - START OF THE SEARCH LOOP
2620 GOSUB 5760
2640 PRINT " ***** WIDTH MUST BE SET TO 110 CHARCTERS ON THE PRINTER *****"
2660 GOSUB 5760
2680 INPUT "ALIGN PAPER TO THE TOP OF PAGE - THEN PRESS ENTER";F9$
2700 REM - PRINT HEADING
2720 LPRINT CHR$(31);"SORTER - ";DATE$
2740 LPRINT "*****"
2760 LPRINT "FOR THE ";G2$;" SORT THE KEYS ARE:"
2780 FOR I=1 TO X
2800 LPRINT L$(Y(I));" = ";K$(I)
2820 NEXT I
2840 LPRINT CHR$(30);LPRINT
2860 R=1
2880 CLS
2900 PRINT @ (10,1),"NOW READING RECORD NUMBER"
2920 FOR I=1 TO LOF(1)
2940 GET 1,I
2960 GET 2,I
2980 PRINT @ (10,27),I
3000 GOSUB 4700
3020 FOR J=1 TO X
3040 IF E1(J)=0 THEN 3160 'IF NOT PARTIAL SKIP OVER
3060 IF P3=1 THEN 3120 'AND SORT ?
3080 IF MID$(F$(Y(J)),E1(J),E2(J))=K$(J) THEN 3280 'DOES PARTIAL KEY MATCH ?
3100 GOTO 3240
3120 IF MID$(F$(Y(J)),E1(J),E2(J))<>K$(J) THEN 3440 'PARTIAL KEY NOT MATCH ?
3140 GOTO 3240
3160 IF P3=1 THEN 3220
3180 IF F$(Y(J))=K$(J) THEN 3280 'DOES KEY MATCH ?
3200 GOTO 3240
3220 IF F$(Y(J))<>K$(J) THEN 3440 'DOES KEY NOT MATCH ?
3240 NEXT J
3260 IF P3=2 THEN 3440 'OR SORT ?
3280 IF G$="N" THEN 3320 'CAN SUMMING BE SKIPPED ?
3300 GOSUB 4140 'DO THE SUMMING
3320 IF O$="N" THEN 3420 'CAN ALPHABETIZING BE SKIPPED ?
3340 W1(R)=I
3360 W2(R)=F$(O1) 'SAVE DATA
3380 R=R+1
3400 GOTO 3440
3420 ON P1 GOSUB 5880,4940,6020,6120
3440 NEXT I
3460 IF O$="Y" THEN 3580 'IS LIST ORDERED ?
3480 IF G$="N" THEN 3540 'CAN SUMMING BE SKIPPED ?
3500 GOSUB 4540
3520 CLOSE 1,2
3540 STOP
3560 REM*****
3580 REM - ORDER THE LIST FOUND
3600 PRINT @ (10,1),"NOW ORDERING THE LIST OF RECORDS FOUND"
3620 N2=R-1
3640 D=INT(N2/2)

```

Program Listing 3 continues

```

3660 IF D<=0 THEN 3920
3680 L2=N2-D
3700 FOR J=1 TO L2
3720 FOR I=J TO 1 STEP -D
3740 IF W2$(I+D)=>W2$(I) THEN 3820
3760 SWAP W2$(I+D);W2$(I)
3780 SWAP W1(I+D);W1(I)
3800 NEXT I
3820 NEXT J
3840 D=INT(D/2)
3860 GOTO 3660
3880 REM*****
3900 REM - PRINT OUT THE ORDERED RECORDS
3920 FOR I=1 TO N2
3940 GET 1;W1(I)
3960 GET 2;W1(I)
3980 GOSUB 4680
4000 ON P1 GOSUB 5880;4940;6020;6120
4020 NEXT I
4040 IF G$="N" THEN 4100
4060 GOSUB 4540
4080 CLOSE 1;2
4100 STOP
4120 REM*****
4140 REM - SUM FOR TOTALS
4160 FOR J2=1 TO N
4180 T7#=0;NN#=.01#
4200 N3=9
4220 IF S(J2)=76 THEN N3=5
4240 IF S(J2)=81 THEN N3=4
4260 IF S(J2)=81 THEN NN#=1#
4280 FOR J3=1 TO N3
4300 T1$=MID$(F$(S(J2));N3+1-J3,1)
4320 FOR J4=0 TO 9
4340 IF S3$(J4)=T1$ THEN 4400
4360 NEXT J4
4380 GOTO 4440
4400 T7#=T7#+NN#*J4
4420 NN#=NN#*10
4440 NEXT J3
4460 T8$(J2)=T8$(J2)+T7#
4480 NEXT J2
4500 RETURN
4520 REM*****
4540 REM - PRINT OUT THE TOTALS
4560 LPRINT:LPRINT
4580 FOR I=1 TO N
4600 LPRINT:LPRINT"SUM FOR ";L$(S(I));" = ";T8#(I)
4620 NEXT I
4640 RETURN
4660 REM*****
4680 REM - BREAK DOWN RECORD INTO ITS PARTS
4700 T=1
4720 FOR J=1 TO 42
4740 F$(J)=MID$(A1$;T,L1(J))
4760 T=T+L1(J)
4780 NEXT J
4800 T=1
4820 FOR J=43 TO NUM
4840 F$(J)=MID$(A2$;T,L1(J))
4860 T=T+L1(J)
4880 NEXT J
4900 RETURN
4920 REM*****
4940 REM - PRINT ENTIRE TRANSMITTAL FORM
4960 LPRINT"61010 ";F$(1);SPACE$(9);F$(2);F$(3);" ";F$(4);" ";F$(5);" ";F$(6)
4980 GOSUB 5660
5000 LPRINT"DIST EMP # POSITION TITLE CL BG DP NAME"
5020 LPRINT:LPRINT F$(7);" ";F$(8);" ";F$(9);" ";F$(10);" ";F$(11)
5040 GOSUB 5660
5060 LPRINT"SOCIAL S. # ADDRESS CITY-STATE ZIP PHONE"
5080 LPRINT:LPRINT F$(12);" ";F$(13);" ";F$(14);" ";F$(15);" ";F$(16);" ";F$(17);" ";F$(18);" ";F$(19);" ";
F$(20);" ";F$(21);"
";F$(22)
5100 GOSUB 5660
5120 LPRINT"EMP.DATE TER.DATE RE RE. DATE BIR.DATE YR.S CZ ET MS SX BANK ACC.#"
5140 LPRINT:LPRINT F$(23);" ";F$(24);" ";F$(25);" ";F$(26);" ";F$(27);" ";F$(28);" ";F$(29);" ";F$(
(30);" ";F$(31);" ";
F$(32);" ";F$(33);" ";F$(34);" ";F$(35);" ";F$(36)
5160 GOSUB 5660
5180 LPRINT"EXPER. CERTIFICATES DG HR IN MJ MJ MN MN MN ASMT L"
5200 LPRINT:LPRINT F$(37);" ";F$(38);" ";F$(39);" ";F$(40);" ";F$(41);" ";F$(42);" ";F$(43);" ";F$(44);" ";F$(
5)
5220 GOSUB 5660
5240 LPRINT"PROB.EX. TB TEST LAST IN. NEXT IN. DAYS H/DY TY EX. DATE TOTAL"
5260 LPRINT:LPRINT F$(46);SPACE$(15);F$(47);" ";F$(48);" ";F$(49);" ";F$(50);" ";F$(51);" ";F$(52);" "
F$(53);" ";F$(54)
5280 GOSUB 5660
5300 LPRINT"PAY$ FED.EXM. ST. EXM. LOC.EXM. R.ID# FICA AP STMT IN.SUB."
5320 LPRINT:LPRINT SPACE$(40);" RES:";F$(75);" CO-CUR:";F$(76);" LONG:";F$(81)
5340 LPRINT:LPRINT F$(55);" ";F$(56);" ";F$(57);" ";F$(58);" ";F$(59);" ";F$(77)
5360 GOSUB 5660
5380 LPRINT"S/L CODE RATE CONTRACT ACCOUNT LIFE"
5400 LPRINT:LPRINT F$(60);" ";F$(61);" ";F$(62);" ";F$(63);" ";F$(64);" ";F$(78)

```

Program Listing 3 continued



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Plugs directly into the CPU or expansion interface. Includes its own regulated power supply and ribbon cable. 1024 bytes of ram in an unused area on the memory map (3000-33FF HEX). Solves memory allocation problems when using monitor programs and utility support routines. Programs stay in the memory box even when the CPU is turned off.

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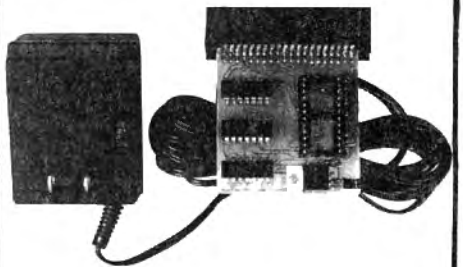
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80 track disk drive \$395
80/80 track disk drive..... \$520

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40 track (bare) disk drive \$250
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Program Listing 3 continued

```

5420 GOSUB 5660
5440 LPRINT"S/L CODE RATE CONTRACT ACCOUNT DENTAL"
5460 LPRINT:LPRINT F$(65);" ";F$(66);" ";F$(67);" ";F$(68);" ";F$(69);" ";F$(79)
5480 GOSUB 5660
5500 LPRINT"S/L CODE RATE CONTRACT ACCOUNT VISION"
5520 LPRINT:LPRINT F$(70);" ";F$(71);" ";F$(72);" ";F$(73);" ";F$(74);" ";F$(80)
5540 GOSUB 5660
5560 LPRINT"S/L CODE RATE CONTRACT ACCOUNT HEALTH"
5580 LPRINT:LPRINT:LPRINT
5600 RETURN
5620 REM*****
5640 REM - DRAW LINES OF STARS AND DASHES
5660 FOR D7=1 TO 70
5680 LPRINT"*";
5700 NEXT D7
5720 LPRINT
5740 RETURN
5760 FOR D7=1 TO 70
5780 PRINT"-";
5800 NEXT D7
5820 PRINT
5840 RETURN
5860 REM*****
5880 REM - PRINT OUT MINIMAL DATA
5900 LPRINT F$(1);" ";F$(2);" ";F$(3);" ";F$(4);" ";F$(6);" ";F$(45);" ";F$(58);" ";F$(59)
5920 LPRINT TAB(69);F$(63);" ";F$(64)
5940 LPRINT TAB(69);F$(68);" ";F$(69)
5960 LPRINT TAB(69);F$(73);" ";F$(74)
5980 RETURN
6000 REM*****
6020 REM - PRINT A MAILING LABEL
6040 LPRINT F$(6);LPRINT F$(8);LPRINT F$(9);" ";F$(10)
6060 LPRINT:LPRINT:LPRINT
6080 RETURN

```

Program Listing 4

```

100 REM - TMATRIX - This program reads the entire personnel file and creates a
120 REM matrix that represents the number of teachers on each step
140 REM and level of the salary schedule for the next year. The
160 REM matrix is stored in a file to be used by a program to do
180 REM salary schedule modeling.
200 REM Written by Theron Wierenga during March of 1980.
220 CLEAR 2000
240 DIM A(55,5),S$(55),Y(55),Z(50),E1(50),E2(50),K$(50),B(55,5)
260 INPUT"ENTER THE FILE NAME FOR THE MATRIX";FIL$
280 OPEN "D",1,"P1",254
300 FIELD 1,254 AS A1$
320 OPEN "D",2,"P2",253
340 FIELD 2,253 AS A2$
360 OPEN "D",3,FIL$,20
380 FIELD 3,4 AS T$(1),4 AS T$(2),4 AS T$(3),4 AS T$(4),4 AS T$(5)
400 OPEN "D",4,FIL$+"L",20
420 FIELD 4,4 AS T2$(1),4 AS T2$(2),4 AS T2$(3),4 AS T2$(4),4 AS T2$(5)
440 FOR I=1 TO 52
460 READ Y(I),S$(I)
480 DATA 1,A,1.5,B,2,C,2.5,D,3,E,3.5,F,4,G,4.5,H,5,I,5.5,J,6,K,6.5,L,7,M
500 DATA 7.5,N,8,0,8.5,P,9,Q,9.5,R,10,S,10.5,T,11,U,11.5,V,12,W,12.5,X
520 DATA 13,Y,14,Z,15,a,16,b,17,c,18,d,19,e,20,f,21,g,22,h,23,i,24,j,25
540 DATA k,26,l,27,m,28,n,29,o,30,p,31,q,32,r,33,s,34,t,35,u,36,v,37,w,38
560 DATA x,39,y,40,z
580 NEXT I
600 FOR I=0 TO 9
620 READ L$(I)
640 DATA 0,1,2,3,4,5,6,7,8,9
660 NEXT I
680 INPUT"ENTER CLASS WANTED FOR THE SEARCH";CL$
700 INPUT"IS THIS AN 'AND' OR 'OR' SORT";ANS
720 IF ANS="AND" OR ANS="OR" THEN 760
740 GOTO 700
760 INPUT"HOW MANY KEYS FOR THE ACCOUNT CODES";NK
780 PRINT"ENTER ITEM NUMBER, POSITION OF 1ST CHARACTER, NUMBER OF CHARACTERS"
800 PRINT"AND THE EXACT KEY FOR EACH ACCOUNT NUMBER DESIRED"
820 FOR I=1 TO NK
840 K$(I)=".+. ."
860 INPUT Z(I),E1(I),E2(I),K$(I)
880 IF K$(I)<>".+. ." THEN 940
900 PRINT"BAD ENTRY - TRY AGAIN"
920 GOTO 860
940 IF Z(I)=59 OR Z(I)=64 OR Z(I)=69 OR Z(I)=74 THEN 980
960 GOTO 900
980 NEXT I
1000 REM*****
1020 REM - START OF MAIN SEARCH LOOP
1040 CLS
1060 PRINT @ (10,1),"NOW READING RECORD NUMBER"
1080 FOR R=1 TO LOF(1)
1100 GET 1,R:GET 2,R
1120 PRINT @ (10,27),R
1140 IF MID$(A1$,26,1)<>CL$ THEN 1760
1160 FOR I=1 TO NK
1180 Z2=(Z(I)-54)/5
1200 Z3=77+(45*(Z2-1))+E1(I)

```

Program Listing 4 continues

Word Processing? You need a SPELLING CHECKER

This is an example of a text being checked by HEXSPELL. The text scrolls up the screen as it is checked. When an error is detected, you have three choices.

1) REPLACE the incorrect word. The replacement word is INSTANTLY RE-CHECKED for correctness, then inserted in the text.

2) The word is correct, leave it as it is.

3) Leave the word as it is, AND tell HEXSPELL to LEARN this word for future reference, with just one keystroke.

Your document is ready to print as soon as HEXSPELL is finished. The word in error e.g. *

WORD IN ERROR: mistake
CONTINUATION: is shown in context, including continuation

PRESS: R) REPLACE WORD S) LEAVE AS IS L) LEARN WORD

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Program continued

```

1220 IF AN$="AND" THEN 1280
1240 IF MID$(A2$,Z3,E2(I))=K$(I) THEN 1340
1260 GOTO 1300
1280 IF MID$(A2$,Z3,E2(I))<>K$(I) THEN 1760
1300 NEXT I
1320 IF AN$="OR" THEN 1760
1340 FOR I=1 TO 52
1360 IF S$(I)<>MID$(A2$,57,1) THEN 1740
1380 FOR J=1 TO 5
1400 IF L$(J)<>MID$(A2$,59,1) THEN 1720
1420 T7#=0:NN#=.01#
1440 FOR K=5 TO 1 STEP -1
1460 H$=MID$(A1$,247+K,1)
1480 FOR L=0 TO 9
1500 IF L$(L)=H$ THEN 1560
1520 NEXT L
1540 GOTO 1600
1560 T7#=T7#+NN#*L
1580 NN#=NN#*10
1600 NEXT K
1620 M=T7#/B
1640 A(I,J)=A(I,J)+M
1660 IF I<27 THEN 1760
1680 B(I,J)=B(I,J)+M
1700 GOTO 1760
1720 NEXT J
1740 NEXT I
1760 NEXT R
1780 REM*****
1800 REM - WRITE MATRIX TO DISC
1820 FOR R=1 TO 52
1840 FOR I=1 TO 5
1860 LSET T$(I)=MK$(A(R,I))
1880 LSET T2$(I)=MK$(B(R,I))
1900 NEXT I
1920 PUT 3,R
1940 PUT 4,R
1960 NEXT R
1980 REM - PRINT OUT THE MATRIX
2000 LPRINT CHR$(31);"EMPLOYEE DISTRIBUTION MATRIX - ";FIL$;" ";DATE$;CHR$(30);LPRINT
2020 LPRINT TAB(10);"BA";TAB(20);"BA+20";TAB(30);"MA";TAB(40);"MA+30";TAB(50);"MA+60";LPRINT
2040 J=13
2060 FOR R=52 TO 1 STEP -1
2080 IF R<26 THEN 2140
2100 LPRINT R-12;"YRS.";
2120 GOTO 2180
2140 LPRINT J;"YRS.";
2160 J=J-.5
2180 GET 3,R
2200 FOR I=1 TO 5
2220 LPRINT TAB(I*10);CVS(T$(I));
2240 NEXT I
2260 LPRINT
2280 NEXT R
2300 LPRINT: LPRINT CHR$(31);"LONGEVITY MATRIX";CHR$(30);LPRINT
2320 FOR R=52 TO 27 STEP -1
2340 LPRINT R-12;"YRS.";
2360 GET 4,R
2380 FOR I=1 TO 5
2400 LPRINT TAB(I*10);CVS(T2$(I));
2420 NEXT I
2440 LPRINT
2460 NEXT R
2480 REM*****END OF PROGRAM*****

```

Program Listing 5

```

100 REM - TEACHER - This program does salary schedule modeling for teachers.
120 REM Total costs are computed for various increases in teacher
140 REM salaries.
160 REM Written by Theron Wierenga during March 1980.
180 DIM M(13,5),S(55,5),N(55,5),N2(55,5)
200 INPUT"ENTER THE FILE NAME OF THE MATRIX YOU WISH TO USE";FIL$
220 OPEN "D",3,FIL$,20
240 FIELD 3,4 AS T$(1),4 AS T$(2),4 AS T$(3),4 AS T$(4),4 AS T$(5)
260 OPEN "D",4,FIL$+"L",20
280 FIELD 4,4 AS T2$(1),4 AS T2$(2),4 AS T2$(3),4 AS T2$(4),4 AS T2$(5)
300 LPRINT
320 REM*****
340 REM - READ THE STEP MULTIPLIERS
360 FOR I=13 TO 1 STEP -1
380 FOR J=1 TO 5
400 READ M(I,J)
420 DATA 163,171,179,182,184,163,164,171,173,175,155,157,164,166,168
440 DATA 148,150,157,159,161,141,143,150,152,154,135,137,143,145,147
460 DATA 129,131,136,138,140,123,125,130,132,134,118,120,124,126,128
480 DATA 113,115,119,121,123,108,110,114,116,118,104,106,110,112,114
500 DATA 100,102,106,108,110
520 NEXT J
540 NEXT I
560 REM*****
580 REM - COMPUTE NEW SALARY SCHEDULE FOR THE INCREASE

```

Program Listing 5 continues

Program Listing 5 continued

```

600 PRINT"ENTER CURRENT BASE AND PERCENT INCREASE"
620 PRINT"EXAMPLE: 12777,7.5"
640 INPUT B,K
660 PRINT"IF PROJECTIONS ARE TO BE ON NEXT YEARS MATRIX ENTER A 1, IF ON THIS"
680 PRINT"YEARS ENTER A 0 (ZERO)";
700 INPUT X9
720 IF X9=0 OR X9=1 THEN 740ELSE 660
740 LPRINT CHR$(31);"SALARY SCHEDULE FOR A";K;"% INCREASE"
760 LPRINT"ON A";B;"DOLLAR BASE USING MATRIX ";FIL$;CHR$(30):LPRINT
780 REM - CALCULATE NEW BASE
800 B2=INT(B*(1+K/100)+.5)
820 LPRINT TAB(16);"AB";TAB(30);"AB+20";TAB(44);"MA";TAB(58);"MA+30";TAB(72);"MA+60"
840 GOSUB 2320
860 FOR I=40 TO 14 STEP -1
880 LPRINT I;"YRS.";
900 FOR J=1 TO 5
920 S(I+12,J)=INT(B2*(M(13,J)/100)+.5)+INT((I-10)/5)*300
940 IF I<40 THEN 980
960 S(I+12,J)=S(I+12,J)-300
980 LPRINT TAB(14*J+1);S(I+12,J);
1000 NEXT J
1020 LPRINT
1040 NEXT I
1060 N=25
1080 FOR I=13 TO 1 STEP -.5
1100 LPRINT I;"YRS.";
1120 FOR J=1 TO 5
1140 Z=INT(I)
1160 IF I=INT(I) THEN 1260
1180 X=(M(Z,J)+M(Z+1,J))/2
1200 S(N,J)=INT(B2*(X/100)+.5)
1220 LPRINT TAB(14*J-4);" " ;S(N,J);
1240 GOTO 1300
1260 S(N,J)=INT(B2*(M(Z,J)/100)+.5)
1280 LPRINT TAB(14*J-4);M(Z,J);S(N,J);
1300 NEXT J
1320 LPRINT
1340 N=N-1
1360 NEXT I
1380 LPRINT:LPRINT
1400 REM*****
1420 REM - READ MATRIX SHOWING EMPLOYEE DISTRIBUTION
1440 FOR R=1 TO 52
1460 GET 3,R
1480 GET 4,R
1500 FOR I=1 TO 5
1520 N(R,I)=CVS(T$(I))
1540 N2(R,I)=CVS(T2$(I))
1560 NEXT I
1580 NEXT R
1600 REM - COMPUTE PRODUCT MATRIX
1620 C2=0:I=13
1640 LPRINT CHR$(31);"EMPLOYEE SALARY DISTRIBUTION"
1642 LPRINT "WITH A";X9;"YEAR STEP INCREASE TO CURRENT FILE";CHR$(30):LPRINT
1660 GOSUB 2420
1680 FOR R=52 TO 1 STEP -1
1700 IF R<26 THEN 1760
1720 LPRINT R-12;"YRS.";
1740 GOTO 1800
1760 LPRINT I;"YRS.";
1780 I=I-.5
1800 C1=0
1820 FOR J=1 TO 5
1840 T9=S(R,J)*N(R-X9,J)
1860 LPRINT TAB(12*J);T9;
1880 C1=C1+T9
1900 NEXT J
1920 LPRINT TAB(73);"/";C1
1940 C2=C2+C1
1960 NEXT R
1980 LPRINT:LPRINT"TOTAL OF ALL TEACHER SALARIES =" ;C2:LPRINT
2000 LPRINT CHR$(31);"LONGEVITY DISTRIBUTION";CHR$(30):LPRINT
2020 GOSUB 2420
2040 C2=0
2060 FOR R=52 TO 26 STEP -1
2080 LPRINT R-12;"YRS.";
2100 C1=0
2120 FOR J=1 TO 5
2140 T9=N2(R-X9,J)*INT((R-22)/5)*300
2160 LPRINT TAB(12*J);T9;
2180 C1=C1+T9
2200 NEXT J
2220 LPRINT TAB(73);"/";C1
2240 C2=C2+C1
2260 NEXT R
2280 LPRINT:LPRINT"TOTAL OF ALL LONGEVITY =" ;C2
2300 STOP
2320 FOR II=1 TO 90
2340 LPRINT"*";
2360 NEXT II
2380 LPRINT
2400 RETURN
2420 LPRINT TAB(13);"AB";TAB(25);"AB+20";TAB(37);"MA";TAB(49);"MA+30";TAB(61);
2440 LPRINT "MA+60";TAB(75);"TOTAL"
2460 GOSUB 2320
2480 RETURN
2500 REM*****END OF PROGRAM*****

```

Computerize your rental records before the first of the month.

The Tenant Tracker

George Kwascha
8007 Mahogany Drive
Charlotte, NC 28212

Tenant	Address	Month	Rent	Date Rec.	Amt. Rec.	Rec. #	Code
Smith Jonathan	1800 Century Av	01-80	250.00	01-02-80	250.00	1234	T
Smith Jonathan	1800 Century Av	12-80	265.00	12-04-80	265.00	1400	T
Smith Jonathan	1800 Century Av	11-80	265.00	11-14-80	275.00	1399	L
Smith Jonathan	1800 Century Av	02-80	250.00	02-01-80	250.00	1245	T
Smith Jonathan	1800 Century Av	03-80	250.00	03-03-80	250.00	1250	T
Smith Jonathan	1800 Century Av	05-80	250.00	05-04-80	250.00	1300	T
Smith Jonathan	1800 Century Av	04-80	250.00	04-01-80	250.00	1405	T
Smith Jonathan	1800 Century Av	06-80	265.00	06-11-80	265.00	1470	N
Smith Jonathan	1800 Century Av	07-80	265.00	07-02-80	265.00	1500	T
Smith Jonathan	1800 Century Av	10-80	265.00	10-01-80	265.00	1801	T
Smith Jonathan	1800 Century Av	09-80	265.00	09-02-80	265.00	1659	T
Smith Jonathan	1800 Century Av	08-80	265.00	08-15-80	275.00	1645	LB
					\$3125.00		

Fig. 1. Rental Record Input File Dump.

If you need a method of computerizing records for rental property that you may be managing, I have written the following program for a local real estate management firm. The program is designed to keep a record of every rental unit's monthly rent payments for one year. Admittedly, it is a simple program that can be altered to suit your particular needs. This modified version will run on a TRS-80, Level II 16K with cassette.

Month	Tenant Name	Rent	Date Rec.	Amt. Rec.	Rec. #	Code
1-80	Smith Jonathan	\$250.00	01-02-80	\$250.00	1234	T
2-80	Smith Jonathan	\$250.00	02-01-80	\$250.00	1245	T
3-80	Smith Jonathan	\$250.00	03-03-80	\$250.00	1250	T
4-80	Smith Jonathan	\$250.00	04-01-80	\$250.00	1405	T
5-80	Smith Jonathan	\$250.00	05-04-80	\$250.00	1300	T
6-80	Smith Jonathan	\$265.00	06-11-80	\$265.00	1470	N
7-80	Smith Jonathan	\$265.00	07-02-80	\$265.00	1500	T
8-80	Smith Jonathan	\$265.00	08-15-80	\$275.00	1645	LB
9-80	Smith Jonathan	\$265.00	09-02-80	\$265.00	1659	T
10-80	Smith Jonathan	\$265.00	10-01-80	\$265.00	1801	T
11-80	Smith Jonathan	\$265.00	11-14-80	\$275.00	1399	L
12-80	Smith Jonathan	\$265.00	12-04-80	\$265.00	1400	T
				\$3125.00		

Fig. 2. Rental Record History for 1980

How the Program Works

After CLOADing and typing Run, the program prints out a heading on the screen and, after a brief delay, will display a menu of options. Option 1 allows you to enter initial rental information. The program prompts for the following fields:

- Tenant name—Enter last name first, then first name (without commas).
- Address—Enter as you wish without commas, but be consistent in format or you may have difficulty retrieving data. In my sample run I used "### street name."
- Rental month—Enter two digits for the months, dash, two digits for the year (MM-YY).
- Date payment received—This, of

Variable	Program Function
M\$(),L\$()	Rental Month (MM-YY)
D\$(),O\$()	Date payment was received (MM-DD-YY)
A(),P()	Rental amount (\$\$.00)
R(),T()	Receipt number or other control number
A\$(),J\$()	Address of rental property (no commas)
N\$(),K\$()	Name of tenant (no commas)
B(),S()	Amount received (\$\$.00)
BB,SS	Totaled amount received
C\$(),U\$()	Code to describe status of payment
Codes used in this program:	
	T - payment in time
	L - late payment with late charge
	N - late payment w/o late charge
	B - bounced check
	D - deposit forfeiture
	O - other

Table 1. Variable Listing

“The program is designed to keep a record of every rental unit’s monthly rent payments for one year.”

course, is very important to any real estate management firm. Use format “MM-DD-YY.”

- Rental amount—Enter rent due as a dollar amount (ex:200.00).
- Amount received—Enter same as above.
- Receipt number—or some other control number, if one is used by your firm.
- Code—Refer to Table 1 for list of codes used in the sample run. You may wish to add your own.

Type Enter after each field entry and End in the tenant name field to close the file and display the option menu.

Option 2 allows you to change data in a file in case an error exists. The program prompts for the tenant name and rental month. Only the first five characters of the name need be entered. However, the entire rental month field (MM-YY) must be entered exactly. When a match occurs in the file, the program will prompt each field once again for the correct data. You need only enter data in the field that needs correcting. In all other fields, type Enter to maintain already existing data. Afterwards, the program will ask whether you want to enter another correction; indicate either yes or no. The Option menu will then be displayed.

Option 3 allows you to inspect the entire file in order of entry. The program will display two months of data per screen. Type Enter to continue scrolling.

Option 4 also permits you to display the file except you must specify the tenant’s name. Once again, only five characters of the name are needed.

In Option 5 by specifying the address the file is displayed. You must enter at least nine characters of the address to obtain a match. In my sample run I used “1800 Cent.”

Option 6 enables you to save your data on cassette tape. Type 6, press record-play on your recorder and hit Enter. The program will prompt you for a menu when it has completed saving the data on tape.

Option 7 allows you to input data from cassette. Type 7, press play on your recorder and hit Enter. The program will prompt you for a menu when it has completed loading.

In Option 8 typing 8 will display the sorting options available.

In Option 9 typing 9 will terminate the program. It also erases all data that you may have in memory, so be sure to save it on tape before ending the program.

Output Reports and Sorting Options

Requesting Option 8 in the above section will display another menu of sorting options. It needs to be pointed out that Op-

tions 2,4,5 and 6 are not included in this program listing. Output reports in the area of real estate management depend on each firm’s needs and must be written as such. I have included two output reports as examples. For example:

- Option 1 will print a hard copy report of the entire file. See Fig. 1 for my sample run. This form of output report is not very practical. It is strictly designed as a control report.

- Option 3 will print a hard copy annual report of each requested address. This option will also sort the data in descending numerical order by month. See Fig. 2 for my sample run. The program will first prompt you for an address. Enter the full address. The program then will prompt you for “# line feeds to heading.” Enter the number of lines you wish skipped before the heading is printed.

Lines	Program Function
10-20	Initialize program and print heading
25-30	Dimension variables
35-80	Display available options
85-95	Direct program to chosen option
100-155	Option 1 - enter payment to file
160-195	Option 2 - make corrections to file
200-220	Option 3 - display entire file
225-280	Option 4 - display individual tenant file
285-300	Option 5 - display address file
305-330	Option 6 - save current file on tape
335-360	Option 7 - input existing file from tape
365-400	Option 8 - list sorting options for output reports
405-415	Direct program to chosen sort option
420-455	Sort Option 1 - Print dump of entire file
460	Sort Option 2 - (unavailable in this listing)
465-532	Sort Option 3 - Annual report sorted by address
535	Sort Option 4 - (unavailable in this listing)
540	Sort Option 5 - (unavailable in this listing)
545	Sort Option 6 - (unavailable in this listing)
550-555	Terminates program
560-565	Subroutines - formatted print for output in Options 3,4,5
570-610	Subroutine - sorts data in descending order, rental month
615-620	Subroutine - used in options 2,4,5

Table 2. Program Summary

Program Listing

```

10 CLEAR2000:CLS:PRINTSTRING$(64,191);STRING$(64,143)
15 PRINT@142,"* * * RENTAL RECORD PROGRAM * * *":PRINTSTRING$(64
,188);STRING$(64,191)
20 FORXX=1TO999:NEXT
25 DIMM$(50),D$(50),A1(50),R(50),C$(50),A$(50),N$(50),B1(50),L(5
0)
30 DIMJ$(50),K$(50),L$(50),O$(50),P1(50),S1(50),T(50),U$(50)
35 CLS:PRINT@10,"* * * OPTIONS AVAILABLE * * *":PRINT:PRINT:YY=0
40 PRINT"TO ENTER PAYMENT TO FILE.....TYPE 1"
45 PRINT"TO MAKE CORRECTIONS TO FILE.....TYPE 2"
50 PRINT"TO DISPLAY ENTIRE FILE.....TYPE 3"
55 PRINT"TO DISPLAY INDIVIDUAL TENANT FILE...TYPE 4"
60 PRINT"TO DISPLAY ADDRESS FILE.....TYPE 5"
65 PRINT"TO SAVE CURRENT FILE ON TAPE.....TYPE 6"
70 PRINT"TO INPUT EXISTING FILE FROM TAPE....TYPE 7"
75 PRINT"TO LIST PROGRAM SORTING OPTIONS....TYPE 8"
80 PRINT"TO END PROGRAM.....TYPE 9"
85 QS=INKEY$:IFQ$=""THEN85ELSE90
90 W=VAL(Q$):ONWGOTO100,160,200,225,265,305,335,365,550
95 PRINT"INCORRECT ENTRY...TRY AGAIN":GOTO85
100 CLS:PRINT"TO CLOSE FILE,TYPE...'END' IN NAME FIELD":P1=P1+1
105 FOR I=P1 TO 50:PRINT"ENTER TENANT NAME (LAST FIRST)"
110 INPUTN$(I):IF N$(I)="END" THEN P1=I-1:GOTO155
115 INPUT"ENTER TENANT ADDRESS(### STREET)";A$(I)
120 INPUT"ENTER RENTAL MONTH (MM-YY)";M$(I)
125 INPUT"ENTER DATE PAYMENT RECEIVED (MM-DD-YY)";D$(I)
130 INPUT"ENTER RENTAL AMOUNT ($$$.$00)";A1(I)

```

Program continues

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Program continued

```

135 INPUT"ENTER AMOUNT RECEIVED ($$$.$00)";BI(I)
140 INPUT"ENTER RECEIPT NUMBER (####)";R(I)
145 PRINT"ENTER CODE...T-ON TIME":PRINTTAB(13)"L-LATE W/CHG":PRI
NTTAB(13)"N-LATE W/O CHG":PRINTTAB(13)"B-BOUNCED CHECK"
150 PRINTTAB(13)"D-DEPOSIT FORFEITURE":PRINTTAB(13)"O-OTHER":INP
UTC$(I):NEXT
155 CLS:PRINT@468,"* * * FILE CLOSED * * *":FORXX=1TO999:NEXT:GO
TO35
160 CLS:INPUT"ENTER NAME (LAST FIRST)";N$:INPUT"ENTER RENTAL MON
TH(MM-YY)";M$:
165 FORI=1TOPI:IFLEFT$(N$(I),5)=LEFT$(N$,5)ANDM$=M$(I)GOTO175
170 NEXT:PRINT"NAME NOT IN FILE":GOTO195
175 PRINT:PRINT"RE-ENTER INFO WITH CORRECTIONS":INPUT"ENTER NAME
";N$(I):INPUT"ENTER ADDRESS";A$(I)
180 INPUT"ENTER RENTAL MONTH(MM-YY)";M$(I):INPUT"ENTER DATE PAYM
T RECEIVED(MM-DD-YY)";D$(I)
185 INPUT"ENTER RENT AMOUNT";A!(I):INPUT"ENTER AMOUNT REC";B!(I)

190 INPUT"ENTER RECEIPT #";R(I):INPUT"ENTER CODE: ";C$(I)
195 N$="":M$="":GOSUB615:IFX$="Y"THEN160ELSE35
200 CLS:FOR I=1TOPI:GOSUB560:YY=YY+1
205 IFYY<>2THEN215
210 YY=0:PRINT@960,"TYPE ENTER TO CONTINUE LISTING";:INPUT
215 NEXT
220 INPUT"TYPE ENTER TO DISPLAY OPTIONS";X:GOTO35
225 CLS:INPUT"ENTER TENANT NAME (LAST FIRST)";N$:PRINT
230 FOR I=1TOPI:IFLEFT$(N$(I),5)<>LEFT$(N$,5)THEN250
235 GOSUB560:YY=YY+1
240 IFYY<>2THEN250
245 YY=0:PRINT@960,"TYPE ENTER TO CONTINUE LISTING";:INPUT
250 NEXT
255 PRINT:PRINT"END OF FILE SEARCH...":PRINT:YY=0
260 N$="":GOSUB615:IFX$="Y"THEN225ELSE35
265 CLS:INPUT"ENTER RENTED ADDRESS (#### STREET)";A$:PRINT
270 FOR I=1TOPI:IFLEFT$(A$(I),9)<>LEFT$(A$,9)THEN290
275 GOSUB560:YY=YY+1
280 IFYY<>2THEN290
285 YY=0:PRINT@960,"TYPE ENTER TO CONTINUE LISTING";:INPUT
290 NEXT
295 PRINT:PRINT"END OF FILE SEARCH...":PRINT:YY=0
300 A$="":GOSUB615:IFX$="Y"THEN265ELSE35
305 CLS:INPUT"PREPARE CASSETTE TO SAVE DATA FILE,WHEN READY TYPE
ENTER";X
310 CLS:PRINT@460,"* * * COPYING FILE ONTO TAPE * * *"
315 PRINT #-1,P1
320 FOR I=1TOPI:PRINT #-1,N$(I),A$(I),M$(I),D$(I),A!(I),B!(I),R(
I),C$(I):NEXT
325 CLS:PRINT@455,"...BURP!..* COPYING COMPLETE ...NOTE TAPE LO
CATION"
330 PRINT@896,"TYPE ENTER TO LIST OPTIONS";:INPUTX:GOTO35
335 CLS:INPUT"PREPARE CASSETTE FOR DATA INPUT...WHEN READY TYPE
ENTER";X
340 CLS:PRINT@460,"* * * COPYING FILE FROM TAPE * * *"
345 INPUT #-1,P1
350 FOR I=1TOPI:INPUT #-1,N$(I),A$(I),M$(I),D$(I),A!(I),B!(I),R(
I),C$(I):NEXT
355 CLS:PRINT@466,"* * * INPUTING COMPLETE * * *"
360 PRINT@896,"TYPE ENTER TO LIST OPTIONS";:INPUT:GOTO35
365 CLS:PRINT@10,"* * * SORTING OPTIONS AVAILABLE * * *":PRINT:PRINT
370 PRINT"TO PRINT A DUMP OF ENTIRE INPUT FILE.....TYPE 1
"
375 PRINT"TO PRINT ANNUAL REPORT SORTED BY RECEIPT #.....TYPE 2
"
380 PRINT"TO PRINT ANNUAL REPORT SORTED BY ADDRESS.....TYPE 3
"
385 PRINT"TO PRINT ANNUAL REPORT SORTED BY TENANT NAME....TYPE 4
"
390 PRINT"TO PRINT MONTHLY REPORT BY ADDRESS.....TYPE 5
"
395 PRINT"TO PRINT MONTHLY REPORT BY TENANT NAME.....TYPE 6
"
400 PRINT"TO LIST ORIGINAL OPTIONS.....TYPE 7
"
405 Q$=INKEY$:IFQ$=""THEN405ELSE410
410 K=VAL(Q$):ONKGO420,460,465,535,540,545,55
415 PRINT"INCORRECT ENTRY...TRY AGAIN":GOTO405
420 BB=0:LPRINTTAB(20)"* * * RENTAL RECORD INPUT FILE DUMP * * *
":LPRINT "
425 LPRINTTAB(3)"TENANT ADDRESS MONTH RENT D
ATE REC AMT REC REC# CODE"
430 FORI=1TOPI

```

Program continues

Software Breakthrough...

NEW

NEW QUIKPRO Program WRITES Programs For You in Minutes.

Review of *QUIKPRO*
by Technical Writer
Wayne Hepburn

QUIKPRO by ICR FutureSoft is the name given a new breakthrough in software. It is written for use on TRS-80 Model I Disc System, Model II and Model III Disc System.

Until now, whenever you wanted a new program, you either had to pay good money for each and every new application program or, if you are capable, spend hours upon hours writing your own. Thanks to a marvelous new program, those choices are obsolete.

Now you can do it yourself. Anytime you want a new program, easily and quickly, you can make your own. Anybody who can turn a computer on and off can do it with *Quikpro* ..it's that easy and fast.

This important breakthrough is the invention of Joseph Tamargo of Florida. His brilliant approach to program writing allows you, finally, to tap the real power of your computer in new ways. I located Mr. Tamargo and interviewed him about the *Quikpro*. He told me "The best part of this program is that it gives you a separate BASIC program every time you use it. You can List each program you create from it, look at it, and actually see what makes it tick."

What's more, I found out you can modify, alter and enhance, even copy, programs you create from using *Quikpro*. I believe there is no other program even close to *Quikpro* for flexibility and ease of program generation. This flexibility may well make *Quikpro* superior to every other Filing, Data Entry

or Data Base Management Program.

The applications are virtually unlimited. Anyone who uses a computer at home, in business, in schools or other educational situations will find hundreds of applications. Teachers, Students, Hobbies, Small and Large Businesses can all find great benefits in using *Quikpro* in any of hundreds of applications like these examples:

Using *Quikpro* you can quickly write programs for Financial Records, Stocks, Checking Accounts, Receiveables, Inventories, Schedules, Personal Records, Statistics, Invoices, Catalogues, Reference Banks, Accounting Data of all kinds, and the list just goes on and on, almost without limit.

Quikpro cuts program development time dramatically...to a fraction of what it would take the old way (the way you do it now). It will generate File and Data Entry sequences for mainframes to remote or host computers. You can create and run a demonstrator program in a few minutes.

Unlike novelty programs you play with for a while and grow tired of, *Quikpro* is one you will regard like a good right arm. Year after year you will use it to create all the new Filing and/or Data Entry programs you will ever need. You never have to buy them again.

Thanks to this invention, the power and speed promised by computers from the beginning have now become a reality. Since I had seen announcements about a program to be imported from a foreign nation, one that supposedly writes programs like *Quikpro* but sells for over six times as much money, I asked Mr. Tamargo for his comments about

that. What he told me is "*Quikpro* is so good, anyone can use it immediately. To prove that point and the tremendous capacity it gives the user, ICR FutureSoft will send *QUIKPRO* directly to users with an absolute moneyback guarantee of satisfaction. The user can try it out on his/her own computer, writing as many programs as desired, for 15 days after delivery, and if not fully satisfied can return the materials for a full refund with no reason given. That's how good *Quikpro* is."

I couldn't argue with that. When the supplier stands behind the product with a 100% refund guarantee, it has to be as good as they say or even better, and I believe it is.

The best news is you don't have to wait to get *QUIKPRO* from ICR FutureSoft or a dealer. You can get it right now by writing or calling. *QUIKPRO* will be delivered immediately by mail with instruction manual and full documentation on the moneyback guarantee basis. To get yours, just write on a plain piece of paper your name and address, specify if you want *QUIKPRO* for TRS-80 Model I, II, or III. Include your check or money order for only \$89.95 or furnish your Visa or Mastercard number and expiration date to charge. Mail to : ICR FutureSoft, 2031 Zeta, P.O. Box 1446, Orange Park FL 32073.

If you prefer to call and get immediate delivery, you can phone 24 hours daily to 1-904-269-1918. Please have your credit card number and computer model information ready. Operator is not qualified to answer questions about the program. Order your *QUIKPRO* right now. Every day you delay is costing you time and money. ✓ 86

“... consider changing dimension statement values and the string space value to suit your needs.”

- Option 7 will return you to the original options menu.

A Few More Pointers

You may have noted that there is no direct method of deleting a record completely. To do this, I recommend that you use Option 2 and enter at least one blank in all fields.

You will need to consider changing dimension statement values and the string space value to suit your needs. One idea that is somewhat useful is to set up an entire year's file with tenant names, addresses, and rental amounts. Then, throughout the remainder of the year, Option 2 can be used to add data each month as the rent is paid.

Sort Option 2 was originally designed to print an annual report sorted by receipt number. Sort Option 4 printed an annual report sorted by name, much like sort Option 3. Sort Options 5 and 6 printed monthly reports sorted by name and address. As you can see, an output report can take many forms. Only you can determine which report best suits your needs. ■

Program continued

```

525 LPRINTAB(53)STRING$(7,45):LPRINTTAB(52);
530 LPRINTUSING"#####.###";SS:GOTO365
532 CLS:PRINT@465,"REQUESTED ADDRESS NOT IN FILE":FORXX=1TO999:N
EXT:GOTO365
535 CLS:PRINT@465,"OPTION UNAVAILABLE AT THIS TIME":FORXX=1TO999
:NEXT:GOTO365
540 GOTO535
545 GOTO535
550 PRINTSTRING$(64,191);STRING$(64,143):PRINTTAB(15)** * * PROG
RAM TERMINATED * * *:PRINTSTRING$(64,188);STRING$(64,191)
555 END
560 PRINTA$(I),N$(I):PRINT"RENTAL MONTH: ";M$(I):PRINT"DATE PAYM
ENT RECEIVED: ";D$(I):PRINT"RENTAL AMOUNT: ";
565 PRINTUSING"#####.###";A$(I):PRINT"AMOUNT RECEIVED: ";:PRINTUSIN
G"#####.###";B$(I):PRINT"RECEIPT# ";R(I);"CODE: ";C$(I):PR
INT:RETURN
570 FORJ=1TOJ1:L(J)=VAL(LEFT$(L$(J),2)):NEXTJ
575 FORI=1TOJ1-1
580 FORJ=I+1TOJ1
585 IFL(I)<=L(J)THEN605
590 L=L(I):K$=K$(I):O$=O$(I):P=P!(I):S=S!(I):T=T(I):U$=U$(I)
595 L(I)=L(J):K$(I)=K$(J):O$(I)=O$(J):P!(I)=P!(J):S!(I)=S!(J):T(
I)=T(J):U$(I)=U$(J)
600 L(J)=L:K$(J)=K$:O$(J)=O$:P!(J)=P:S!(J)=S:T(J)=T:U$(J)=U$
605 NEXTJ
610 NEXTI:RETURN
615 PRINT"FOR ANOTHER NAME OR ADDRESS TYPE Y-YES OR N-NO"
620 X$=INKEY$:IFX$=""THEN620ELSERETURN

```

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HOW ACCEL2 WORKS

TRS-80 Model I/III BASIC Compiler

ACCEL2 uses a novel translation technique that keeps code growth down and insures highest compatibility with BASIC source programs while giving huge speedups. Only a carefully chosen subset of BASIC instructions is translated. The non-compileable statements are left in the compiled program in their original source form and at run-time are actually given to the BASIC interpreter to execute. Program flow may flip into direct execution of the compiled machine instructions and then flop back to interpretation many times during execution.

Why Compilation improves performance.

*Name Resolution. Term given to the process of identifying the value of a variable given its name. As a program runs, the interpreter builds a dictionary consisting of a chain of items, each containing a variable name, data type and current value. Every time a variable is to be resolved the interpreter must sequentially search this dictionary. By contrast, ACCEL2 builds the variable dictionary once at compile time and thereafter can refer to the variable names by direct address, with no run-time search.

*Line Resolution. The interpreter has to take the line-number following a GOTO or GOSUB, convert it to binary, and then search the program sequentially to find the target line. At compile-time ACCEL2 generates single machine-instructions for GOTO or GOSUB using the actual address of the target line. For the interpreter, both name resolution and line resolution get slower as the program gets more complex, whereas for compiled code these two operations are independent of program size or number of variables.

*Computational Operations. The interpreter must parse each statement every time, find the one-byte codes that correspond to the operations, look ahead to the next operator to establish the precedence rules and check for data-type mismatch and conversion. Constants must be converted from character strings to internal binary. But under ACCEL2 constants are converted and embedded right in the Z80 instruction stream, and operations are translated once and for all at compile-time into sequences of calls to ROM or the run-time component. INTEGER operations are actually turned into directly executing straight-line Z80 code!

The result is a mixture of BASIC statements and machine language instructions, usually not more than 1½-2½ times the size of the original but running much faster (can be 50-100 times as fast with some programs).

ACCEL2: 32K TRS-80 Model I/III. Compiles selected subset in all variable types, local and global compilation options, output save to ES/F wafer, disk under TRSDOS, NEWDOS, NEWDOS/80.

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To landlord or not to landlord: that is the calculation.

Investment Property Analysis

Leslie E. Sparks
1014 Evergreen Drive
Durham, NC 27712

Investment. A hard copy option is also available.

Overview of the Program

First, enter the data for the program from the keyboard by filling in a five-page menu. The data you enter will concern ex-

penses, income, and capital costs of the investment. When the menu is full and you are sure that the data are correct, you can initiate calculations by pressing G.

The program calculates the loan payment schedule for the life of the investment (not the life of the loan). It also does a

The analysis of a real estate investment involves some rather tedious calculations. For example, mortgage payment schedules must be calculated in order to find loan costs. You also need to figure present values of all the cash flows from investments in order to calculate their present worth.

You can use tables to help with the calculations, but often the tables don't have the values you need. And if you have several investments to analyze, the use of tables soon becomes more work than you bargained for. The obvious thing to do is to let your TRS-80 do the tedious math for you.

The program presented here is designed to do all the needed calculations to evaluate an investment in rental property. It calculates the taxable and spendable rental income expected from the investment, along with the expected capital gain. The program can handle both first and second mortgages, which can have both different interest rates and different lives. The life of the investment can be less than, greater than or equal to the life of either of the loans.

The program presents a summary of the calculations which shows total rental income (after tax), total spendable income (after tax), capital gain profit, total profit and the total spendable profit from the

Program Listing

```

10 REM *****
20 REM RENTAL PROPERTY INVESTMENT ANALYSIS BY L. E. SPARKS
30 REM VERSION 2.0 19 JULY 1980 32K TRS-80 DISK BASIC
40 REM *****
50 CLS
60 CLEAR 1000
70 PRINT
80 PRINT STRING$(63,"*")
90 PRINT TAB(15)"RENTAL PROPERTY INVESTMENT ANALYSIS "
100 PRINT TAB(15)"          BY"
110 PRINT TAB(15)"          L. E. SPARKS VERSION 2.0"
120 PRINT STRING$(63,"*")
130 GOSUB 7060
140 PRINT STRING$(64,"=")
150 PRINT"ENTER PROPERTY IDENTIFICATION INFORMATION."
160 LINEINPUT ZZ$
170 CLS
180 PRINT "INITIALIZATION "
190 DEFINT J,K
200 DEFSTR F
210 DIM F(41),E(20),EF(20),FT(12),R(12),RY(12),NU(12),Z(30),EQ(20),EY(20),DS(30)
220 REM P1 INTEREST PAID ON 1ST MORTGAGE P2 PRINCIPAL PAID 1ST
P3 INTEREST PAID 2ND MORTGAGE P4 PRINCIPAL PAID 2ND
230 DIM P1(35),P2(35),P3(35),P4(35)
240 REM TX TAX PAID,RA AFTER TAX INCOME,CF CASH FLOW AFTER TAX
250 DIM RX(30),RF(30),RZ(30),RT(30),RL(30),RI(30),RG(30)
260 DIM TX(30),RA(30),CF(30),DF(30),SF(30)
270 GOSUB 7350
280 GOSUB1150
290 JM = +1
300 CLS
310 GOSUB 3390
320 IF JM = -1 THEN 280
330 GOSUB 3860
340 GOSUB 4690
350 PRINT"DO YOU WANT HARD COPY ?"
360 GOSUB 410
370 IF Y$="Y"THEN GOSUB5630

```

Program continues

Program continued

```
380 PRINT"DO YOU WANT TO DO ANOTHER ANALYSIS ?"
390 GOSUB 410
400 IF Y$="Y" THEN 280 ELSE END
410 REM GET CHARACTER
420 Y$=INKEY$:IF Y$="" THEN 420 ELSE IX=ASC(Y$)
430 RETURN
440 REM NUMERIC INPUT
450 IC = JV
460 IF IC = 0 THEN IC =55
470 V$=Y$
480 IF Y$="$" THEN V$=""
490 IF Y$="," THEN V$=""
500 Z$=Y$
510 REM
520 PRINT@JP*64+IC,Z$;CHR$(140);" ";
530 GOSUB 410 : 'GO GET A CHARACTER
540 IF IX=13 RETURN : 'RETURN IF ENTER PRESSED
550 IF IX = 8 THEN 560 ELSE 580
560 IF LEN(V$) = 0 THEN 580
570 IF MID$(Z$,LEN(Z$),1) <> "," THEN V$= LEFT$(V$,LEN(V$)-1)
580 IF IX= 8 THEN IF LEN(Z$)>0 THEN Z$=LEFT$(Z$,LEN(Z$)-1)
590 IF IX = 8 THEN 510
600 IF IX>31 THEN Z$=Z$+Y$
610 IF Y$="," THEN 650
620 IF Y$="$" THEN 650
630 IF Y$="%" THEN 650
640 V$=V$+Y$
650 GOTO510
660 STOP
670 REM INSTRUCTION SUBROUTINE
680 PRINT " MAY BE USED TO CHANGE PAGES. ";
690 PRINT CHR$(91);" ";CHR$(92);" ";CHR$(93);" ";CHR$(94);" ARE
ACTIVE . ";
700 PRINT"USE G TO START CALCULATIONS. ";
710 PRINT"ENTER DATA TO CHANGE";
720 RETURN
730 REM UPDATE INSTRUCTIONS
740 PRINT @ 896,STRING$(63,"*");
750 PRINT @JZ,STRING$(63," ");
760 PRINT@960,"USE ";CHR$(93); " FOR CORRECTIONS ";
770 PRINT"ENTER REST OF ITEM AND <ENTER> TO CHANGE";
780 RETURN
790 REM POINTER CONTROL
800 PRINT@JP*64+JV,CHR$(94);
810 GOSUB410:'GO GET A CHARACTER
820 PRINT@JP*64+JV," ";
830 ID=0
840 JD=0
850 IF IX=27 OR IX=91 OR IX=123 THEN ID=-1
860 IF IX=26 OR IX=10 OR IX=13 THEN ID=ID+1
870 IF IX = 8 THEN JD =-JA ELSE IF IX=9 THEN JD+=JA
880 JV=JV+JD
890 IF JV>JM THEN JV=JN ELSE IF JV<JN THEN JV=JM
900 IP=IP+ID
910 IF IP<1 THEN IP=MX
920 IF IP>MX THEN IP=1
930 JP=IP+IJ
940 RETURN
950 REM POINTER CONTROL FOR INCOME SUB
960 IF IP = 8 THEN JV = 0 ELSE JV = IC
970 PRINT@JP*64+JV,CHR$(94);
980 GOSUB 410
990 PRINT @ JP*64+JV," ";
1000 ID = 0 : JD = 0
1010 IF IX = 27 OR IX = 91 OR IX = 123 THEN ID = -1
1020 IF IX = 26 OR IX = 10 OR IX = 13 THEN ID = +1
1030 IF IX = 8 THEN JD =-14
1040 IF IX = 9 THEN JD = +14
1050 IF IP = MX AND ID = -1 THEN IP = IP -2: GOTO1000
1060 IP = IP + ID
1070 IC = IC + JD
1080 IF IP <1 THEN IP = MX
1090 IF IP = 7 THEN IP = MX:JV = 0
1100 IF IP > MX THEN IP = 1
1110 IF IC >30 THEN IC = 16
1120 IF IC < 16 THEN IC = 30
1130 JP = IP + IJ
1140 RETURN
1150 REM PAGE 1
1160 JP=6
1170 IP=1
1180 IJ =5:JV=28
1190 IF JM = -1 THEN 2710
1200 JN=28:JM=48:JA=20
1210 CLS:PRINT:PRINT STRING$(63,"="): PRINT** PAGE 1 OF 5 PAGES
* FIXED EXPENSES *
```

Program continues

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Program continued

```

1220 PRINT STRING$(63,"=")
1230 PRINT "      ITEM";TAB(40);"$ /MO      $ /YR"
1240 PRINT STRING$(63,"-")
1250 FOR J = 1 TO 6
1260 PRINT " ";
1270 PRINT USING F(J);EF(J);:PRINT USING "      $###,###.##";E
Y(J)
1280 NEXT J
1290 JZ = 832
1300 PRINT@832,"> ";
1310 GOSUB670 : 'PRINT INSTRUCTIONS
1320 IC =45:MX=5
1330 GOSUB 790
1340 IF ID<>0 THEN 1330 ELSE ID=1
1350 IF IX<32 THEN 1330
1360 IF Y$="G" THEN RETURN
1370 IF Y$=">" THEN 1580
1380 IF Y$ = "<" THEN 1150
1390 GOSUB730
1400 GOSUB 1480
1410 GOSUB 1540
1420 IP=IP+1
1430 IF IP<1 THEN IP=MX
1440 IF IP>MX THEN IP=1
1450 JP=IP+IJ
1460 CLS
1470 GOTO1210
1480 REM UPDATE INFORMATION
1490 GOSUB 440
1500 IF JV=JM THEN EY(IP)=VAL(V$):EF(IP)=EY(IP)/12:RETURN
1510 EF(IP) = VAL(V$)
1520 EY(IP)=12.*EF(IP)
1530 RETURN
1540 REM CALCULATE TOTAL COSTS
1550 EF(6) = EF(1)+EF(2)+EF(3)+EF(4)+EF(5)
1560 EY(6) = EY(1)+EY(2)+EY(3)+EY(4)+EY(5)
1570 RETURN
1580 REM PAGE 2
1590 IP=1:JP=3:IJ=2
1600 JV=28:JN=28:JM=48:JA=20
1610 CLS
1620 PRINT "*** PAGE 2 OF 5 PAGES ** OPERATING COSTS ***"
1630 PRINT"ITEM";TAB(33);"$ /MO      $ /YR"
1640 PRINT STRING$(63,"=")
1650 FOR J= 1 TO 12
1660 PRINT USING F(J+6);E(J);:PRINT USING "      $###,###.##";
EQ(J)
1670 NEXT J
1680 JZ = 896 +64
1690 PRINT @ 896,"< OR >";
1700 MX=11: IC =45
1710 GOSUB670
1720 GOSUB790
1730 IF ID<>0 THEN 1720 ELSE ID=1
1740 IF IX<32 THEN 1720
1750 GOSUB 730
1760 IF Y$="G" THEN RETURN
1770 IF Y$="<" THEN 1150
1780 IF Y$=">" THEN 2000
1790 GOSUB 1860
1800 GOSUB1920
1810 IP=IP+1
1820 IF IP<1 THEN IP=MX
1830 IF IP>MX THEN IP=1
1840 JP = IP + IJ
1850 GOTO 1610
1860 REM UPDATE COSTS
1870 GOSUB 440
1880 IF JV=JM THEN EQ(IP)=VAL(V$):E(IP)=EQ(IP)/12.:RETURN
1890 E(IP)=VAL(V$)
1900 EQ(IP)=E(IP)*12.
1910 RETURN
1920 REM SUM TOTAL EXPENSES
1930 E(12)=0
1940 EQ(12)=0
1950 FOR JJ = 1 TO 11
1960 E(12)=E(12)+E(JJ)
1970 EQ(12) = EQ(12)+EQ(JJ)
1980 NEXT JJ
1990 RETURN
2000 REM INCOME ESTIMATES GO HERE
2010 IJ = 2
2020 MX = 8
2030 IP = 1
2040 IF IP = MX THEN 2590
2050 IC = 16
    
```

Program continues

Program continued

```
2060 JP = 3
2070 JV=28:JA=20:JN=28:JM=48
2080 CLS
2090 IF IP = MX THEN JV = 0 ELSE JV = IC
2100 PRINT "*** PAGE 3 OF 5 PAGES *** INCOME ESTIMATES ***"
2110 PRINT STRING$(63,"=")
2120 PRINT"TYPE OF UNIT ";TAB(18);"# UNITS";TAB(30);"RENT $/MO";
TAB(50);"RENT $ YR"
2130 FOR J = 1 TO NT
2140 PRINT " ";
2150 PRINT FT(J);TAB(20);NU(J);TAB(30);
2160 PRINT USING "$###,###.##";R(J);: PRINT TAB(45);
2170 PRINT USING F(0);RY(J)
2180 NEXT J
2190 PRINT "**** TOTAL ";TAB(20);NS;TAB(30);
2200 PRINT USING "$#,#####.##";RM;:PRINT TAB(45);
2210 PRINT USING F(0);RY
2220 PRINT " ";
2230 PRINT USING F(41);VA
2240 PRINT"****";:PRINT USING " DOLLAR COST OF VACANCY $###,##
.##/YR";VA*RY/100.
2250 RG = RY*(100.-VA)/100
2260 PRINT "****";:PRINT USING" ADJUSTED GROSS RENTS $#,#####
.##/YR";RG;PRINT STRING$(63,"=")
2270 PRINT @ 896, "< & > MAY BE USED TO CHANGE PAGES ";
2280 PRINT CHR$(91);" ";CHR$(92);" ";CHR$(93);" ";CHR$(94);" AR
E ACTIVE";
2290 PRINT " ENTER NEW DATA TO CHANGE. PRESS G TO START CALCULA
TIONS ";
2300 GOSUB 950
2310 MX = 8:IJ=2
2320 IF ID <> 0 THEN 2300 ELSE ID = 1
2330 IF IX < 31 THEN 2300
2340 IF Y$ = "G" THEN RETURN
2350 IF Y$ = "<" THEN 1580
2360 IF Y$ = ">" THEN 2710
2370 JZ = 832
2380 GOSUB730
2390 GOSUB 2500
2400 GOSUB 2600
2410 IF IP = MX THEN 2440
2420 IF IC <30 THEN IC = 30 :GOTO2080
2430 IF IC > 16 THEN IC =16
2440 IP = IP + 1
2450 IF IP >MX THEN IP =1
2460 IF IP < 1 THEN IP =MX
2470 JP = IP+IJ
2480 IF IP = 7 THEN IP = MX
2490 GOTO 2080
2500 REM DATA ENTRY
2510 GOSUB 440
2520 IF IP = MX THEN 2590
2530 IF IC = 30 THEN 2560 : REM TO ENTER RENTS
2540 NU(IP) = VAL(V$)
2550 GOTO2570
2560 R(IP)=VAL(V$)
2570 RY(IP) = R(IP)*NU(IP)*12
2580 RETURN
2590 VA = VAL(V$): IC = 16:RETURN
2600 REM SUM UP TOTALS
2610 NS = 0
2620 RM = 0
2630 RY = 0
2640 FOR JJ = 1 TO NT
2650 NS = NS+NU(JJ)
2660 RM = RM + NU(JJ)*R(JJ)
2670 RY = RY + RY (JJ)
2680 NEXT JJ
2690 RETURN
2700 END
2710 REM ENTER MORTGAGE COSTS ETC
2720 CLS
2730 JV=0:JA=0:JM=0:JN=0
2740 IC = 60
2750 IP = 1
2760 MX = 12
2770 IJ = 1
2780 JP = 2
2790 JZ = 896+64
2800 CLS
2810 PRINT "**** PAGE 4 OF 5 **** INVESTMENT DATA ****"
2820 PRINT STRING$(63,"=")
2830 FOR JJ= 1 TO 12
2840 PRINT " ";
2850 PRINT USING F(JJ+18);Z(JJ)
2860 NEXT JJ
```

Program continues

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70

“...if you have several investments to analyze, the use of tables soon becomes more work than you bargained for.”

Program continued

```

2870 PRINT @ 896, "< OR > ";
2880 MX = 12 : IC = 55
2890 GOSUB 670
2900 GOSUB 790
2910 IF ID <> 0 THEN 2900 ELSE ID = 1
2920 IF IX < 32 THEN 2900
2930 GOSUB 730
2940 IF Y$ = "G" THEN RETURN
2950 IF Y$ = ">" THEN 3070
2960 IF Y$ = "<" THEN 2000
2970 GOSUB 3030
2980 IP = IP + 1
2990 IF IP > MX THEN IP = 1
3000 IF IP < 1 THEN IP = MX
3010 JP = IP + IJ
3020 GOTO 2800
3030 REM UPDATE INFORMATION
3040 GOSUB 440
3050 Z(IP) = VAL(V$)
3060 RETURN
3070 REM MORTGAGE ETC DATA CONT.
3080 IP = 1
3090 MX = 10
3100 JP = 2
3110 JZ = 896+64
3120 CLS
3130 PRINT "***** PAGE 5 OF 5 PAGES ***** INVESTMENT DATA CONT *
*****"
3140 PRINT STRING$(63, "=")
3150 FOR J = 1 TO MX
3160 PRINT " ";
3170 PRINT USING F(J+30);Z(J+12)
3180 NEXT J
3190 PRINT @ 896, "< ";
3200 IC = 55
3210 GOSUB 670
3220 GOSUB 790
3230 IF ID <> 0 THEN 3220 ELSE ID = 1
3240 IF IX < 32 THEN 3220
3250 GOSUB 730
3260 IF Y$ = "G" THEN RETURN
3270 IF Y$ = "<" THEN 2710
3280 IF Y$ = ">" THEN 3070
3290 GOSUB 3350
3300 IP = IP+1
3310 IF IP > MX THEN IP = 1
3320 IF IP < 1 THEN IP = MX
3330 JP = IP + IJ
3340 GOTO 3120
3350 REM UPDATE INFORMATION
3360 GOSUB 440
3370 Z(IP+12) = VAL(V$)
3380 RETURN
3390 REM CHECK DATA INPUT
3400 SC=Z(1)-Z(2)-Z(3)-Z(7)+Z(11)+Z(12)
3410 CLS
3420 PRINT STRING$(64, "*")
3430 IF SC <> 0 THEN PRINT "POSSIBLE ERROR IN DATA INPUT" ELSE 35
10
3440 PRINT "THE SUM OF THE DOWN PAYMENT THE FIRST AND SECOND MORT
GAGES"
3450 PRINT "DOES NOT EQUAL THE PURCHASE PRICE PLUS CLOSING COSTS"
3460 PRINT "DO YOU WISH TO REVIEW DATA ?"
3470 GOSUB 410
3480 IF Y$ = "N" THEN 3510
3490 JM = -1
3500 RETURN
3510 REM CHECK TO SEE IF INTEREST RATES ARE NON ZERO
3520 CLS
3530 PRINT STRING$(64, "*")
3540 IF Z(4) = 0 AND Z(3) > 0 THEN 3550 ELSE 3600
3550 PRINT "POSSIBLE ERROR. INTEREST RATE FOR FIRST"
3560 PRINT "MORTGAGE IS ZERO."
3570 PRINT "DO YOU WISH TO REVIEW DATA?"
3580 GOSUB 410
3590 IF Y$ = "Y" THEN JM = -1:RETURN
3600 IF Z(7)>0 AND Z(8) = 0 THEN 3610 ELSE 3660

```

Program continues

Property tax	-----	\$4,400/yr
Insurance	-----	\$100/mo
License	-----	\$600/yr
Replacement reserves	-----	\$75/mo
Other fixed exp	-----	\$30/mo
Janitor	-----	\$450/mo
Soc sec, unemp	-----	\$45/mo
Garbage collection	-----	\$25/mo
Utilities	-----	\$25/mo
Supplies	-----	\$25/mo
Maintenance	-----	\$600/yr
Advertising	-----	\$40/mo
Management	-----	\$300/mo
Purchase price	-----	\$380,000
Down payment	-----	\$130,000
1st mortgage	-----	\$200,000
2nd mortgage	-----	\$50,000
Interst rate	-----	12% both
Life 1st	-----	25 years
Life 2nd	-----	10 years
Payments per year	-----	12 for both
Life of investment	-----	5 years
Life of bldg for dep	-----	33 years
Per cent for land	-----	20%
Escalation for investment	-----	15% per year
Escalation for rent	-----	9% per year
Escalation for expense	-----	10% per year
Discount rate	-----	9%
Marginal income tax	-----	50%
Capital gains rate	-----	25%
Cost of selling	-----	6% of selling price

2 one bedroom unfur rent at \$400/mo,
2 two bedroom fur at \$475/mo
4 three bedroom fur at \$635/mo.
Vacancy allowance = 6%

Fig. 1. Data for Example.

year by year calculation of the income and expenses (escalated as specified by the user) for the life of the investment. Straight line depreciation is also used as part of the taxable income calculation. Both taxable and spendable income are calculated.

At the end of the last year of the investment, the program calculates the expected selling price (based on a user-specified escalation factor), capital gains tax, total rental income, total capital gain, and total profit from the investment. The program also calculates the present value of various cash flows from the investment and compares the present value of the

* Page 1 of 5 pages * Fixed Expenses *

Item	\$/Mo	\$/Yr
Property Tax	→ \$ 0.00	\$ 0.00
Insurance	\$ 0.00	\$ 0.00
License	\$ 0.00	\$ 0.00
Replacement Reserves	\$ 0.00	\$ 0.00
Other Fixed Expenses	\$ 0.00	\$ 0.00
Total Fixed Expenses	\$ 0.00	\$ 0.00

> May Be Used To Change Pages. !←→ Are Active. Use G To Start Calculations. Enter Data To Change

Fig. 1. First Page of Menu, Fixed Expenses.

*"This message alerts the user
that money must be taken from savings..."*

** Page 2 of 5 pages ** Operating Costs **

Item	\$/Mo	\$/Yr
Janitor -----	\$ 0.00	\$ 0.00
Gardener -----	\$ 0.00	\$ 0.00
Soc. Security & Unemp ----	\$ 0.00	\$ 0.00
Garbage Collection -----	\$ 0.00	\$ 0.00
Utilities -----	\$ 0.00	\$ 0.00
Supplies -----	\$ 0.00	\$ 0.00
Maintenance -----	\$ 0.00	\$ 0.00
Advertising -----	\$ 0.00	\$ 0.00
Management -----	\$ 0.00	\$ 0.00
Free Rent (Mgr Janitor) ----	\$ 0.00	\$ 0.00
Other Operating Expenses -	\$ 0.00	\$ 0.00

< OR > May Be Used to Change Pages. ↕ ↔ Are Active.
Use G to Start Calculations. Enter Data to Change

Fig. 2. Page 2 of Menu, Operating Costs.

total profit with the amount of the down payment. If the total profit from the investment is less than the down payment, the program prints out a message calling attention to that fact. The program also prints out a message if the spendable income from the investment is negative. This message alerts the user that money must be taken from savings or borrowed to keep the investment going.

After the summary results are displayed, you are asked if you wish to see detailed results for each year. If you do, the income, expenses, and tax paid for each year are displayed.

If the spendable income for any year is negative, a message is printed to alert you that the investment is not paying for itself. If the taxable income is negative, a message is printed to inform you that there is a tax loss that can be used to shelter other incomes.

If you do not want to see the yearly details, you will be asked if you want a printout of the calculations. If you do, the input data and all the calculated results are printed on the line printer.

After the results of the last year are

Type of Unit	# Units	Rent \$/Mo	Rent \$ Yr
1 Bed Fur →	0	\$ 0.00	\$ 0.00
1 Bed Unfur	0	\$ 0.00	\$ 0.00
2 Bed Fur	0	\$ 0.00	\$ 0.00
2 Bed Unfur	0	\$ 0.00	\$ 0.00
3 Bed Fur	0	\$ 0.00	\$ 0.00
3 Bed Unfur	0	\$ 0.00	\$ 0.00
**** Total	0	\$ 0.00	\$ 0.00
Allowance For Vacancies As % Of Rents—0.00%			
**** Dollar Cost of Vacancy \$ 0.00/Yr			
**** Adjusted Gross Rents \$ 0.00/Yr			

< & > May Be Used To Change Pages ↕ ↔ Are Active
Enter New Data To Change. Press G To Start Calculations

Fig. 3. Page 3 of Menu, Income Estimates.

Program continued

```

3610 PRINT"POSSIBLE ERROR."
3620 PRINT"INTEREST RATE FOR SECOND MORTGAGE IS ZERO."
3630 PRINT"DO YOU WISH TO REVIEW DATA ?"
3640 GOSUB 410
3650 IF Y$="Y" THEN JM=-1:RETURN
3660 REM CHECK TO SEE IF NUMBER OF PAYMENTS ENTERED
3670 IF Z(3)>0 AND Z(5) >0 THEN 3710
3680 PRINT"POSSIBLE ERROR IN INPUT DATA"
3690 PRINT "LIFE OF 1ST MORTGAGE IS 0. DO YOU WISH TO REVIEW DAT
A?"
3700 GOSUB410:IF Y$="Y" THEN JM = -1:RETURN
3710 IF Z(6)>0 THEN 3760
3720 PRINT "POSSIBLE ERROR IN INPUT DATA!"
3730 PRINT "NUMBER OF LOAN PAYMENTS PER YEAR IS 0."
3740 PRINT "DO YOU WISH TO REVIEW DATA ?"
3750 GOSUB 410 : IF Y$="Y" THEN JM =-1:RETURN
3760 IF Z(7)>0 AND Z(9)>0 AND Z(10) > 0 THEN RETURN
3770 IF Z(9) > 0 THEN 3810 ELSE PRINT "POSSIBLE ERROR IN INPUT DA
TA"
3780 PRINT "LIFE OF SECOND MORTGAGE IS 0. DO YOU WISH TO REVIEW
DATA?"
3790 GOSUB 410
3800 IF Y$="Y" THEN JM =-1:RETURN
3810 IF Z(10)>0 THEN RETURN ELSE PRINT "POSSIBE ERROR IN INPUT D
ATA."
3820 PRINT"THE NUMBER OF LOAN PAYMENTS PER YEAR IS 0"
3830 PRINT "DO YOU WISH TO REVIEW DATA?":GOSUB 410
3840 IF Y$="Y" THEN JM=-1
3850 RETURN
3860 REM SET UP TO CALCULATE PAYMENT SCHEDULE
3870 REM CHECK TO SEE IF THERE IS FIRST MORTGAGE
3880 IF Z(3)=0 THEN 4270
3890 REM NOW AMORIZE LOAN
3900 CLS
3910 PRINT"PLEASE WAIT IT WILL TAKE 1 TO 2 MINUTES FOR CALCULATI
ONS"
3920 PRINT"* FIRST MORTGAGE CALCULATIONS "
3930 REM X1 IS INTEREST RATE PER PERIOD
3940 X1=Z(4)/Z(6)/100:REM INTEREST PER PERIOD
3950 V=(X1+1.0000)[(Z(6)*Z(5))
3960 P=X1*V*Z(3)/(V-1.)
3970 REM NOW CALCULATE PAYMENT SCHEDULE
3980 S=0
3990 S1=0
4000 N3=1
4010 S2=0
4020 A=Z(3)
4030 J1=1
4040 N2=Z(6)*Z(5)
4050 IF N2>Z(6)*Z(13) THEN N2=Z(6)*Z(13):'LIMIT CALCULATION TO L
IFE OF INVESTMENT
4060 B1=0:' B1=BALANCE ON FIRST MORTGAGE AT END OF N2 PERIODS
4070 P1(J1)=0
4080 P2(J1)=0
4090 J2=1
4100 X2= INT(X1*A*100)/100 : REM INTEREST TO NEAREST CENT
4110 PP=P-X2
4120 P2(J1)=P2(J1)+PP
4130 P1(J1)=P1(J1)+X2
4140 S=S+PP
4150 A=A-PP
4160 IF N3=N2 THEN 4240 :REM HAVE FINISHED PAYMENT SCHEDULE
4170 IF J2=Z(6) THEN 4210 :REM HAVE COMPLETED 1 YEAR OF CALCULA
TION
4180 N3=N3+1
4190 J2=J2+1
4200 GOTO4100
4210 J1=J1+1
4220 N3=N3+1
4230 GOTO 4070
4240 REM FINISHED WITH FIRST MORTGAGE
4250 B1=A:IF B1<0 THEN B1=0
4260 A=0
4270 REM NOW DO SECOND MORTGAGE
4280 IF Z(7)=0 THEN 4670
4290 REM NOW AMORIZE LOAN
4300 CLS

```

Program continues

“...unlike depreciation of the building, depreciation of the furnishings is a real out-of-pocket expense.”

Program continued

```

4310 PRINT"PLEASE WAIT IT WILL TAKE 1 TO 2 MINUTES FOR CALCULATI
ONS"
4320 PRINT "*** SECOND MORTGAGE CALCULATIONS"
4330 REM X1 IS INTEREST RATE PER MONTH
4340 X1=Z(8)/Z(10)/100.
4350 V=(X1+1.0000)[(Z(10)*Z(9))
4360 P=X1*V*Z(7)/(V-1.)
4370 REM NOW CALCULATE PAYMENT SCHEDULE
4380 S=0
4390 S1=0
4400 N3=1
4410 S2=0
4420 A=Z(7)
4430 J1=1
4440 FOR J = 1 TO Z(9):P3(J)=0:P4(J)=0:NEXT J
4450 N2=Z(9)*Z(10)
4460 IF N2>Z(10)*Z(13) THEN N2=Z(10)*Z(13)
4470 B2=0:'B2=BALANCE ON SECOND MORTGAGE
4480 P3(J1)=0
4490 P4(J1)=0
4500 J2=1
4510 X2= INT(X1*A*100)/100 : REM INTEREST TO NEAREST CENT
4520 PP=P-X2
4530 P4(J1)=P4(J1)+PP
4540 P3(J1)=P3(J1)+X2
4550 S=S+PP
4560 A=A-PP
4570 IF N3=N2 THEN 4650 :REM HAVE FINISHED PAYMENT SCHEDULE
4580 IF J2=Z(10) THEN 4620 :REM HAVE COMPLETED 1 YEAR OF CALCUL
ATION
4590 N3=N3+1
4600 J2=J2+1
4610 GOTO4510
4620 J1=J1+1
4630 N3=N3+1
4640 GOTO 4480
4650 REM FINISHED
4660 B2=A:IF B2<0 THEN B2=0
4670 REM ALL LOANS TAKEN CARE OF
4680 RETURN
4690 REM NOW DO YEAR BY YEAR CALCULATION
4700 DF=0:TR=0:TP=0:PQ=0:DS=0
4710 DR = 1+Z(20)/100.: 'DISCOUNT RATE FACTOR
4720 N%=INT(Z(13)):'LIFE OF INVESTMENT
4730 DP=Z(1)*(1-Z(15)/100.)/Z(14):'STRAIGHT LINE DEPRECIATION
4740 EY=1+Z(18)/100.: 'ESCLATION FOR EXPENSES
4750 EX='+Z(17)/100.: 'ESCLATION FOR INCOME
4760 X9=EY(6)
4770 X8=EQ(12)
4780 ZT = Z(21)/100.
4790 EQ=0
4800 TI = 0 : 'TOTAL INTEREST PAID
4810 SI = 0 : 'TOTAL AFTER TAX SPENDABLE INCOME
4820 FOR J = 1 TO N%
4830 RX(J) = RG*EX[(J-1)]: 'ADJUSTED GROSS INCOME ESCLATION LAG
S
4840 RF(J) = X9*EY[J]: 'FIXED EXPENSES
4850 RZ(J) = X8*EY[J]: 'OPERATING EXPENSES
4860 RL(J) = P1(J)+P2(J)+P3(J)+P4(J) : 'LOAN PAYMENTS PRINCIPAL
+ INTEREST
4870 PQ = PQ+(P2(J)+P4(J))*DR[-J] : 'PRESENT VALUE OF PRINCIPAL
PAYMENTS
4880 RI(J) = P1(J)+P3(J) : 'INTEREST PAID FOR YEAR
4890 TI = TI + RI(J) : 'TOTAL INTEREST PAID TO DATE
4900 RG(J) = RX(J) - RF(J) - RZ(J) - RL(J) - Z(23) : 'GROSS INC
OME
4910 RT(J) = RX(J) - RF(J) - RZ(J) - RI(J) - DP - Z(23) : 'TAXA
BLE INCOME
4920 IF RT(J) < 0 THEN AL = AL + RT(J) :GOTO4980
4930 IF AL > RT(J) THEN RT(J) = 0:AL = AL - RT(J) :GOTO4980
4940 IF AL > 0 THEN RT(J) = RT(J)-AL : 'ADJUST FOR PREVIOUS LOSS
4950 TX(J) = ZT*RT(J) : 'TAX PAID
4960 RA(J) = RT(J)-TX(J) : 'AFTER TAX PROFIT
4970 GOTO 5000
4980 TX(J)=0
4990 RA(J)=RT(J)
5000 CF(J) = RA(J)+DP

```

Program continues

printed or if you decline the printout option, you will be asked if you want to analyze another investment. If you do, the program returns to page one of the Input menu. Note that all the previously entered data are still in the program. Thus, if you want to look at the same investment but with a different interest rate, just change the interest rate. You do not need to reenter all the data. You may initiate calculations for the next investment at any time by pressing G.

Input

Data input is handled by filling in a five-page menu. The information required for each of the five pages is shown in Figs. 1 through 5. You can move from page to page using the < and > keys. The > key allows you to go to the next page in the menu while the < key returns you to the previous page. Note that the > page is the only key active for page 1 and the < key is the only key active for page 5.

The particular data item being entered is indicated by the position of the right arrow (which is used as a marker) on the CRT. You can move around the menu pages by using the four arrows on the keyboard. Each arrow moves the marker arrow on the CRT in the same direction that the arrow points. For example, the up arrow moves the marker on the CRT up.

The first page is used to enter data for fixed expenses. Replacement reserves are the monies that you should set aside each month or each year to ensure that there is money to replace such items as furnishings in the rental property. Basically this is the same as an account for depreciation of the furnishings of the property. It is shown as a separate expense because, unlike depreciation of the building, depreciation of the furnishings is a real out-of-pocket expense. It is highly probable you will need to replace some of the furnishings during the life of the investment and money that is set aside can handle this. This handling of the depreciation of the furnishing may not meet IRS standards, but it is realistic and the proper way to handle it for analysis purposes.

The second page of the menu is for operating expenses. These are expenses over which you have some control. You can get rid of the gardener, for example if things get tough. The items here are straightforward and do not require much discussion. The main thing to remember is to include all expenses. If you have unlisted expenses, enter them as other expenses. Be sure to include an expense for management—even if you manage the property yourself.

The third page of the menu is for entering expected income from rentals. You can

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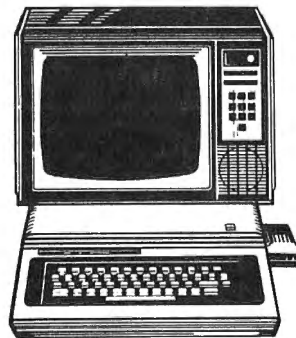
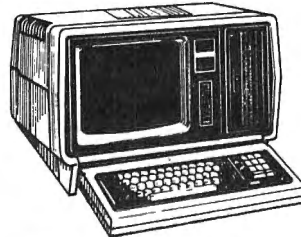
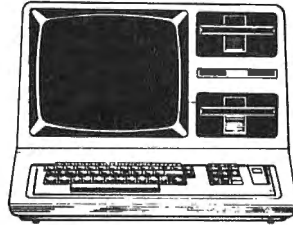
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"The discount factor is the minimum return that you will accept on your money."

**** Page 4 of 5 **** Investment Data ****

Program continued

```

5010 DF(J) = CF(J)*DR[-J
5020 TR = TR + CF(J)
5030 DF = DF+DF(J)
5040 EQ=P2(J)+P4(J)+EQ : 'EQUITY ACCUMULATED
5050 SI = SI + RG(J) - TX(J) : 'TOTAL SPENDABLE INCOME TO DATE
5060 DS(J) = (RG(J)-TX(J))*DR[-J : 'DISCOUNTED SPENDABLE CASH
5070 DS = DS + DS(J) : 'ACCUMULATED DISCOUNTED SPENDABLE CASH
5080 NEXT J
5090 REM NOW CALCULATE SELLING PRICE
5100 SP = Z(1)*(1+Z(16)/100.)*Z(13)
5110 PR=SP*(1-Z(19)/100):REM SELLING PRICE LESS COST OF SELLING
5120 AD = DP*Z(13) : 'ACCUMULATED DEPRECIATION
5130 PR = PR - Z(1) +AD : 'TAXABLE PROFIT ON SALE OF PROPERTY NOTE
DEPRECIATION ADDED BACK Z(1) PURCHASE PRICE
5140 TX = PR *Z(22)/100. : 'TAX PAID ON SALE OF PROPERTY
5150 PZ = PR - TX -AD : 'AFTER TAX PROFIT NOTE DEPRECIATION REMOV
ED FROM PROFIT
5160 PD = PZ*DR[-N% : 'DISCOUNTED VALUE OF AFTER TAX PROFIT
5170 DZ = PD + DF : 'TOTAL PRESENT VALUE OF PROFITS FROM INVESTMEN
T
5180 REM
5190 REM NOW PRINT OUT THE RESULTS
5200 PRINT
5210 PRINT "**** RESULTS OF CALCULATIONS ****"
5220 PRINT STRING$(64, "=")
5230 PRINT "SUMMARY RESULTS"
5240 PRINT "SELLING PRICE OF PROPERTY";TAB(40);:PRINT USING F(0)
;SP
5250 PRINT "OUTSTANDING LOAN BALANCE ";TAB(40);:PRINT USING F(0)
;B1+B2
5260 PRINT "DOWN PAYMENT + PRINCIPAL PAYMENTS ";TAB(40);:PRINT U
SING F(0);EQ+Z(2)
5270 PRINT "TAXABLE PROFIT FROM SALE OF PROPERTY";TAB(40);:PRINT
USING F(0);PR
5280 PRINT "TOTAL AFTER TAX PROFIT FROM RENTS";TAB(40);:PRINT US
ING F(0);TR
5290 PRINT "AFTER TAX PROFIT FROM SALE OF PROPERTY";TAB(40);:PRI
NT USING F(0);PZ
5300 PRINT "TOTAL PROFIT FOR INVESTMENT ";TAB(40);:PRINT USING F(
0);PZ + TR
5310 PRINT "PRESENT VALUE OF PROFITS";TAB(40);:PRINT USING F(0);D
Z
5320 IF DZ < Z(2) THEN PRINT "NOTE PRESENT VALUE OF PROFITS IS L
ESS THAN YOUR DOWN PAYMENT" ELSE 5340
5330 PRINT "THIS IS NOT A GOOD INVESTMENT."
5340 IF AL<0 THEN PRINT "NOTE INVESTMENT DID NOT PAY ITS WAY":PRI
NT "YOU WOULD HAVE TO TAKE MONEY FROM SAVINGS":PRINT "OR BORROW MO
RE MONEY TO PAY EXPENSES"
5350 PRINT "DO YOU WANT TO SEE DETAILS?"
5360 GOSUB 410
5370 IF Y$="N" THEN RETURN
5380 IF Y$<>"Y" THEN PRINT "PLEASE ANSWER Y OR N":GOTO5350
5390 REM PRINT DETAILS
5400 CLS
5410 FOR J = 1 TO N%
5420 CLS
5430 PRINT "** RESULTS FOR YEAR ";J;" *"
5440 PRINT STRING$(63, "=")
5450 PRINT USING "RENTAL INCOME -----$###,###.##
";RX(J)
5460 PRINT USING "FIXED EXPENSES -----$###,###.##
";RF(J)
5470 PRINT USING "OPERATING EXPENSES -----$###,###.##
";RZ(J)
5480 PRINT USING "INTEREST PAID -----$###,###.##
";RI(J)
5490 PRINT USING "PRINCIPAL PAID -----$###,###.##
";P2(J)+P4(J)
5500 PRINT USING "DEPRECIATION ALLOWANCE -----$###,###.##"
;DP
5510 PRINT USING "TAXABLE INCOME -----$###,###.##
";RT(J)
5520 PRINT USING "TAX PAID -----$###,###.##
";TX(J)
5530 SF(J)=RG(J)-TX(J)
5540 PRINT USING "AFTER TAX PROFIT -----$###,###.##
";RA(J)

```

Program continues

```

-----
-> Purchase Price of Property -----$ 0.00
Amount of Down Payment -----$ 0.00
Amount of First Mortgage -----$ 0.00
Interest Rate First Mortgage % Per Yr --- 0.00%
Life of First Mortgage Years ----- 0
Number of Payments Per Year ---- 0
Amount of Second Mortgage -----$ 0.00
Interest Rate Second Mortgage % Yr ---- 0.00%
Life of Second Mortgage Years ----- 0
Number of Payments Per Year ----- 0
Closing Costs -----$ 0.00
Other Costs of Buying -----$ 0.00
< OR > May Be Used to Change Pages N--- Are Active.
Use G to Start Calculations. Enter Data to Change.

```

Fig. 4. Page 4 of Menu, Investment Data.

enter information for six different rental units (one, two and three bedroom furnished and unfurnished rental units).

You are asked for two pieces of information for each type of rental unit—the number of units and the monthly rent for that type of unit. The computer calculates the total annual rent expected from all units of a given type and the monthly and yearly income for all rental units.

The program calculates and displays the dollar cost of the vacancy allowance and the expected rental income also, taking into account the vacancy allowance.

The fourth page is used to enter information on the capital costs of the investment. Here, you enter information on the purchase price of the property, the amount of the down payment, the amount of the first and second mortgages, the closing cost and other costs involved in purchasing property.

The fifth and final page is where you enter information on life of the investment, life of the property for depreciation, expected escalation for rents and expenses, expected appreciation of the investment, income tax rates, and the discount factor.

The discount factor is the minimum return that you will accept on your money. What you enter here is up to you. In general, a good value for the discount rate is the tax-free interest you can earn on a risk-free investment.

Output

The first two pages of the hard-copy output are a repeat of the input information in the same format as the menus used to enter the input information. If you don't believe the calculated output, carefully double-check the input data.

The third page of the hard-copy output is a summary of the calculated results. The first item on this page is total spendable income from rents. Total spendable income is the total income available to spend on your computer or other bad

“... it is possible to have a positive taxable income and a negative spendable income...”

habits. Spendable income is the rental receipts minus all the cash outlays you made to operate the property. Cash outlays also include the total loan payment (principal and interest) but do *not* include depreciation of the property. Principal payments are included as pocket expenses because your checkbook sees the total loan cost as the interest payment plus the principal payment. Depreciation is not included as pocket expense because you don't write a check for depreciation. Depreciation is an expense for tax purposes but not an expense for the purpose of calculating spendable income.

If the total spendable income is negative, then the rental income from the property was not enough to cover upkeep. You need to borrow or withdraw money from savings when the spendable income is negative. Note that it is possible to have a positive taxable income and a negative spendable income or vice versa.

(Remember: Spendable income is what goes into or comes out of your pocket.)

The second item shown is the after-tax profit from rents. This is what the IRS says you made, or lost, from renting the property. In this case, depreciation (straight line is used in the program) is an allowable expense but principal payment is not. A negative after-tax profit from rents can be used to shelter income from other sources (check with the IRS to be sure). So a negative after-tax profit from rents is not all bad—provided, of course, that the spendable income is positive.

The next several items in the output show the capital gain realized by selling the property at the end of the investment life. First the selling price, followed by the purchase price are shown. Next, your equity in the property is shown (down payment plus principal payments). Loan balance for the first and second mortgages is shown followed by the balance after the loans are paid off. The accumulated depreciation follows along with the cost basis for tax purposes. The

*****Page 5 of 5 Pages*****Investment Data Cont*****

→ Life of Investment Years -----	0
Life of Prop For Depreciation Years -----	0
Per Cent of Value Due to Land -----	0.00%
Escalation Rate For Property %/Yr-----	0.00%
Escalation Rate For Rent Increases -----	0.00%
Escalation Rate For Expense Increases -----	0.00%
Costs of Selling Property % of Price -----	0.00%
Discount Rate % -----	0.00%
Marginal Income Tax Rate % -----	0.00%
Tax Rate for Capital Gains % -----	0.00%

< May be Used to Change Pages ↑↔ Are Active. Use G to Start Calculations. Enter Data to Change

Program continued

```

5550 PRINT USING "SPENDABLE CASH FLOW -----$###,####.##"
;SF(J)
5560 PRINT USING "CASH FLOW -----$###,####.##";
CF(J)
5570 PRINT USING "DISCOUNTED CASH FLOW -----$###,####.##"
;DF(J)
5580 PRINT STRING$(63,"=")
5590 PRINT@896,"PRESS ANY KEY TO SEE MORE "
5600 GOSUB410
5610 NEXT J
5620 RETURN
5630 REM HARD COPY ROUTINE
5640 CLS
5650 PRINT"**** HARD COPY ROUTINE ****"
5660 PRINT "CHECK TO SEE IF PRINTER IS ON "
5670 PRINT STRING$(64,"=")
5680 LPRINT TAB(5)"REAL ESTATE INVESTMENT ANALYSIS"
5690 LPRINT TAB(5)"VERSION 2.0 BY L. E. SPARKS"
5700 LPRINT STRING$(70,"=")
5710 LPRINT TAB(5)"PROPERTY IDENTIFICATION ";ZZ$
5720 LPRINT STRING$(70,"=")
5730 LPRINT TAB(25)"*****";TAB(30);"INPUT DATA ****"
5740 LPRINT STRING$(70,"=")
5750 LPRINT TAB(5)"* PAGE 1 OF 5 PAGES * FIXED EXPENSES "
5760 LPRINT STRING$(70,"=")
5770 LPRINT TAB(5)" ITEM ";TAB(40);"$/M0 $/YR"
5780 LPRINT STRING$(70,"=")
5790 FOR J = 1 TO 6
5800 LPRINT TAB(5);:LPRINT USING F(J);EF(J);
5810 LPRINT USING "$###,###.##";EY(J)
5820 NEXT J
5830 LPRINT STRING$(70,"=")
5840 LPRINT TAB(5)"** PAGE 2 OF 2 * OPERATING EXPENSES **"
5850 LPRINT STRING$(70,"=")
5860 LPRINT TAB(5)"ITEM ";TAB(40);"$/M0";TAB(50);"$/YR"
5870 LPRINT STRING$(70,"=")
5880 FOR J = 1 TO 12
5890 LPRINT TAB(5);:LPRINT USING F(J+6);E(J);
5900 LPRINT USING "$###,###.##";EQ(J)
5910 NEXT J
5920 LPRINT STRING$(70,"=")
5930 LPRINT TAB(5)"*** PAGE 3 OF 5 PAGES * INCOME ESTIMATES ***"
5940 LPRINT STRING$(70,"=")
5950 LPRINT TAB(5)"TYPE OF UNIT";TAB(18);"# OF UNITS";TAB(30);"R
ENT $/MO";TAB(50);"RENT $/YR"
5960 FOR J = 1 TO NT
5970 LPRINT TAB(5);:LPRINT FT(J);TAB(20);NU(J);TAB(30);
5980 LPRINT USING "$#,#####.##";R(J);:LPRINT TAB(45);
5990 LPRINT USING F(0);RY(J)
6000 NEXT J
6010 LPRINT TAB(5);:LPRINT USING"VACANCY ALLOWANCE AS % OF RENTS
= ##.###";VA
6020 LPRINT TAB(5);:LPRINT USING"DOLLAR COST OF VACANCY = $###,
##.##/YR";VA*RY/100
6030 LPRINT TAB(5);:LPRINT USING "ADJUSTED GROSS RENTS = $####
,###.##/YR";RG
6040 LPRINT STRING$(70,"=")
6050 LPRINT CHR$(140):"TOP OF FORM PRINTER CONTROL
6060 LPRINT " ":LPRINT" ":LPRINT" "
6070 LPRINT TAB(5)"PAGE 2 OF OUTPUT INPUT DATA CONT "
6080 LPRINT STRING$(70,"=")
6090 LPRINT " "
6100 LPRINT TAB(5)"**** PAGE 4 OF 5 PAGES * INVESTMENT INFORMAT
ION ****"
6110 LPRINT STRING$(70,"=")
6120 FOR J = 1 TO 12
6130 LPRINT TAB(5);:LPRINT USING F(J+18);Z(J)
6140 NEXT J
6150 LPRINT STRING$(70,"=")
6160 LPRINT TAB(5)"***** PAGE 5 OF 5 PAGES INVESTMENT DATA CONT
*****"
6170 LPRINT STRING$(70,"=")
6180 FOR J = 13 TO 22
6190 LPRINT TAB(5);:LPRINT USING F(J+18);Z(J)
6200 NEXT J
6210 LPRINT STRING$(70,"=")

```

Program continues

Fig. 5. Page 5 of Menu, Investment Data.

"The investment with the maximum present value of spendable income is the best."

Program continued

```

6220 LPRINT CHR$(140):' TOP OF FORM FOR PRINTER
6230 LPRINT " "
6240 LPRINT " "
6250 LPRINT " "
6260 LPRINT TAB(5)"PAGE 3 OF OUTPUT "
6270 LPRINT STRING$(70,"=")
6280 LPRINT " "
6290 REM
6300 REM
6310 REM NOW LPRINT OUT THE RESULTS
6320 LPRINT
6330 LPRINT TAB(5)"**** RESULTS OF CALCULATIONS ****"
6340 LPRINT STRING$(70,"=")
6350 LPRINT " "
6360 LPRINTTAB(9) "          SUMMARY RESULTS          "
6370 LPRINT STRING$(70,"=")
6380 LPRINT TAB(5)"TOTAL SPENDABLE INCOME FORM RENTS ";TAB(44);
6390 LPRINT USING F(0);SI
6400 LPRINT TAB(5)"TOTAL AFTERTAX PROFIT FROM RENTS";TAB(44);:L
PRINT USING F(0);TR
6410 LPRINT TAB(5)"SELLING PRICE ";TAB(44);:LPRINT USING F(0);SP
6420 LPRINT TAB(5)"PURCHASE PRICE";TAB(44);:LPRINT USING F(0);Z(
1)
6430 LPRINT TAB(5)"DOWN PAYMENT + PRINCIPAL PAYMENTS";TAB(44);:L
PRINT USING F(0);EQ+Z(2)
6440 LPRINT TAB(5)"PRESENT VALUE OF PRINCIPAL PAYMENTS ";TAB(44)
;
6450 LPRINT USING F(0);PQ
6460 LPRINT TAB(5)"PRESENT VALUE OF EQUITY ";TAB(44);
6470 LPRINT USING F(0);Z(2)+PQ
6480 LPRINT TAB(5)"BALANCE LEFT ON LOANS";TAB(44);:LPRINT USING
F(0);B1+B2
6490 LPRINT TAB(5)"SELLING PRICE - LOAN BALANCE ";TAB(44);:LPRIN
T USING F(0);SP-B1-B2
6500 LPRINT TAB(5)"ACCUMULATED DEPRECIATION ";TAB(44):LPRINT US
ING F(0);AD
6510 LPRINT TAB(5)"COST BASIS FOR TAX PURPOSES ";TAB(44):LPRINT
USING F(0);Z(1)-AD
6520 LPRINT TAB(5)"COST BASIS FOR TAX IS PURCHASE PRICE - ACCUMU
LATED DEPRECIATION"
6525 LPRINT TAB(5)"COST OF SELLING ";TAB(44);:LPRINT USING F(0);
SP*Z(19)/100
6530 LPRINT TAB(5)"TAXABLE PROFIT FROM SALE OF PROPERTY";TAB(44)
);:LPRINT USING F(0);PR
6540 LPRINT TAB(5)"CAPITAL GAINS TAX ";TAB(44);:LPRINT USING F(0)
);TX
6550 LPRINT TAB(5)"AFTER TAX PROFIT ON SALE";TAB(44);:LPRINT USI
NG F(0);PZ
6560 LPRINT TAB(5)"TOTAL AFTER TAX PROFIT FOR INVESTMENT ";TAB(
44);:LPRINT USING F(0);PZ + TR
6570 LPRINT TAB(5)"PRESENT VALUE OF PROFIT ON SALE ";TAB(44);:LP
RINT USING F(0);PZ*(1+Z(20)/100.)[-Z(13)
6580 LPRINT TAB(5)"PRESENT VALUE OF ALL PROFITS";TAB(44);:LPRIN
T USING F(0);DZ
6590 LPRINT TAB(5)"PRESENT VALUE OF ALL SPENDABLE INCOME";TAB(44)
):LPRINT USING F(0);DS+PZ*(1+Z(20)/100.)[-Z(13)
6600 LPRINT " ":LPRINT STRING$(70,"*")
6610 IF DZ > Z(2) THEN 6630
6620 IF DZ < Z(2) THEN LPRINT TAB(5)"NOTE THAT PRESENT VALUE OF
PROFITS IS LESS THAN YOUR DOWN PAYMENT":LPRINT TAB(5)"THIS IS N
OT A GOOD INVESTMENT"
6630 IF SI<0 THEN LPRINT TAB(5)"!!! NOTE !!! THE INVESTMENT DID
NOT PAY ITS WAY":LPRINT TAB(5)"YOU WOULD HAVE TO TAKE MONEY FRO
M SAVINGS":LPRINT TAB(5)"OR BORROW MORE MONEY TO PAY EXPENSES."
6640 LPRINT STRING$(70,"=")
6650 REM LPRINT DETAILS
6660 JP = 3
6670 LPRINT CHR$(140):'TOP OF FORM PRINTER CONTROL
6680 LPRINT " ":LPRINT " ":LPRINT " "
6690 LPRINT TAB(5)"PAGE ";JP+1;" OF OUTPUT DETAILED RESULTS"
6700 JP=JP+2
6710 JZ=1
6720 FOR J = 1 TO N%
6730   JZ=JZ+1
6740   LPRINT TAB(5)"** RESULTS FOR YEAR ";J;" **"
6750   LPRINT STRING$(70,"=")

```

Program continues

IRS requires that you subtract the accumulated depreciation from the purchase price of the property to calculate the cost of the property for tax purposes. The taxable capital gain followed by the capital gains tax paid are then shown.

The next four items summarize the total profit from the investment. The last items show the present value of the total after-tax profit and total spendable profit expected from the investment. These three items are very important. If you are evaluating more than one investment, the investment with the maximum present value of spendable income is the best.

If you are evaluating one investment, the investment is attractive if the present value of the spendable income is greater than your down payment and equity. Any investment that gives a present value less than your down payment and equity is a poor one. A present value less than your down payment and equity means that you could increase your spendable income by putting money in a risk-free investment represented by the discount rate rather than from the investment you're analyzing.

The next several pages of the printed output are the year-by-year details of income and expenses for the rental property. The main thing to look at here is the spendable income—if it is negative, you need to borrow or take money from savings to keep the investment going. Also note the taxable income. If it is negative, you have a tax loss that can be used to shelter other incomes (check with the IRS for specifics). As long as the spendable income is positive, a negative taxable income is fine—especially if you're in a high tax bracket.

In the program, tax losses in one year are carried forward to offset the next year's taxable rental income.

The output displayed on the CRT is essentially the same as the printed output. Some of the items are not displayed, but all of the important information is shown both on the CRT and the hard-copy output.

Calculations

The calculations performed by the program are straightforward. The program calculates the loan payment requirements of the first and second mortgages for the life of the investment (not the life of the loan). The interest and principal amounts are kept separate for later use.

After the mortgage calculations are taken care of, the program does a year-by-year calculation of the income and the expenses of the investment. The expenses are escalated using the escalation factor and entered as part of the input data. The rental income is also escalated. However, the program assumes that rental price in-

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City/State/Zip

Type of Practice

I'm not ready to order, but please send me your brochure.

"The present value of all cash flow is calculated using the discount rate entered during data entry."

Program continued

```

6760 LPRINT TAB(5);:LPRINT USING "RENTAL INCOME -----
----$###,###.##";RX(J)
6770 LPRINT TAB(5);:LPRINT USING "FIXED EXPENSES -----
----$###,###.##";RF(J)
6780 LPRINT TAB(5);:LPRINT USING "OPERATING EXPENSES -----
----$###,###.##";RZ(J)
6790 LPRINT TAB(5);:LPRINT USING "INTEREST PAID -----
----$###,###.##";RI(J)
6800 LPRINT TAB(5);:LPRINT USING "PRINCIPAL PAID -----
----$###,###.##";P2(J)+P4(J)
6810 LPRINT TAB(5);:LPRINT USING "SPENDABLE GROSS INCOME ----
----$###,###.##";RG(J)
6820 IF RG(J)<0 THEN LPRINTTAB(5)"*** NOTE THAT GROSS INCOME I
S NEGATIVE. YOU NEED A LOAN TO KEEP GOING "
6830 LPRINT TAB(5);:LPRINT USING "TAXABLE INCOME -----
----$###,###.##";RT(J)
6840 IF RT(J) < 0 THEN LPRINT TAB(5)" *** NOTE YOU HAVE A LOSS F
OR TAX PURPOSES WHICH CAN SHELTER OTHER INCOME."
6850 IF RG(J) <0 THEN LPRINT TAB(5)"*** YOU ALSO HAVE A REAL OUT
OF POCKET LOSS AS NOTED ABOVE!!"
6860 LPRINT TAB(5);:LPRINT USING "DEPRECIATION -----
----$###,###.##";DP
6870 LPRINT TAB(5);:LPRINT USING "TAX PAID -----
----$###,###.##";TX(J)
6880 LPRINT TAB(5);:LPRINT USING "AFTER TAX PROFIT -----
----$###,###.##";RA(J)
6890 LPRINT TAB(5);:LPRINT USING "TAXABLE CASH FLOW -----
----$###,###.##";CF(J)
6900 LPRINT TAB(5);:LPRINT USING "SPENDABLE CASH FLOW -----
----$###,###.##";RG(J)-TX(J)
6910 LPRINT TAB(5);:LPRINT USING "DISCOUNTED TAXABLE CASH FLOW
--$###,###.##";DF(J)
6920 LPRINT TAB(5);:LPRINT USING "DISCOUNTED SPENDABLE CASH FL
OW $###,###.##";DS(J)
6930 LPRINT STRING$(70,"=")
6940 IF JZ < 3 THEN 6980 ELSE LPRINT CHR$(140)
6950 LPRINT " ":LPRINT " ":LPRINT "PAGE ";JP;" OF OUTPUT. DETA
ILED RESULTS CONT "
6960 LPRINT STRING$(70,"=")
6970 JZ=1:JP=JP+1
6980 NEXT J
6990 LPRINT TAB(5)"NOTE.SPENDABLE CASH FLOW IS TAKEN AS THE TOTA
L INCOME":LPRINT TAB(5)"MINUS FIXED & OPERATING EXPENSES";
7000 LPRINT "MINUS INTEREST & PRINCIPAL PAYMENTS MINUS TAXES."
7010 LPRINT TAB(5)" CASH FLOW IS TOTAL INCOME MINUS FIXED & OPE
RATING EXPENSES MINUS INTEREST"
7020 LPRINT TAB(5)"MINUS TAXES. NOTE PRINCIPAL PAYMENT IS NOT TA
X DEDUCTABLE.
7030 LPRINT STRING$(70,"=")
7040 RETURN
7050 RETURN
7060 REM INSTRUCTION ROUTINE
7070 PRINT "THIS PROGRAM IS WRITTEN FOR A TRS-80 MODEL 1 WITH"
7080 PRINT "LEVEL II BASIC AND 32 K RAM."
7090 PRINT"THIS PROGRAM IS DESIGNED TO CALCULATE THE PRESENT VAL
UE"
7100 PRINT"OF THE CASH FLOWS FROM A RENTAL PROPERTY INVESTMENT."
7110 PRINT"DATA ARE ENTERED BY FILLING IN THE MENUS THAT FOLLOW.
"
7120 PRINT"USE > TO GO TO THE NEXT MENU PAGE. USE < TO GO TO THE
"
7130 PRINT"PREVIOUS MENU PAGE. USE THE ARROWS TO MOVE AROUND THE
MENU.
7140 PRINT"MENU INSTRUCTIONS ARE PRINTED AT THE BOTTOM OF EACH P
AGE."
7150 PRINT STRING$(63,"=")
7160 PRINT" ***** PRESS ANY KEY TO CONTINUE *****"
7170 Y$=INKEY$:IF Y$="" THEN 7170 ELSE CLS
7180 PRINT" ***** INSTRUCTION CONTINUED *****"
7190 PRINT STRING$(63,"=")
7200 PRINT"FOR SOME ITEMS YOU HAVE THE OPTION OF ENTERING COSTS

7210 PRINT"ON A MONTHLY OR YEARLY BASIS DEPENDING ON THE DATA "
7220 PRINT"YOU HAVE. MOVE THE ARROW TO THE APPROPRIATE COLUMN"
7230 PRINT"AND ENTER THE DATA. THE COMPUTER WILL CALCULATE THE"
7240 PRINT"COST THAT YOU DID NOT ENTER. FOR EXAMPLE IF YOU ENTER
"

```

Program continues

creases are on a yearly basis since rents are often set by leases which run for a year or more.

Depreciation is calculated for the building only. Straight line depreciation is used.

The present value of all cash flow is calculated using the discount rate entered during data entry. The present value of all principal payments is also calculated.

The selling price is calculated by escalating the purchase price which is specified by the input data. The taxable capital gain is calculated by subtracting the accumulated depreciation from the purchase price which gives you the cost basis. This is then subtracted from the selling price, less the selling costs from the basis. The present value of the net, after tax profit of the sale, is then calculated. Finally the present values, after taxes, of cash flow and spendable cash flow are calculated.

User Instructions

In this section, user instructions followed by an example run are presented. After you have run the example, you should not have any trouble running the program.

Before showing you the input data menu, the program asks you to provide identification for the investment you are analyzing. You can use any identification scheme you want. The program uses a Line Input (Disk Basic) so you can enter any set of characters you wish for the identification. If you do not have Disk Basic, change Line Input to Input.

After you have provided the program identification, program operation is a matter of filling in the menu pages and then pressing G when you are ready to initiate calculations. You select the data item you want to enter by using the > and < keys to find the appropriate page and then by using the up, down, left, or right arrow to move the marker on the CRT to the appropriate entry point. When you enter numbers from the keyboard, you may use commas to separate thousands. For example, the number 1000 may be entered as 1,000 or 1000. It is easier to keep track of things if I enter the commas.

The key to running the program is filling out the menus. (See Fig. 1, page 1 of the menu.) There are three columns for the page—Item, \$/MO, and \$/YR. The item column is the name of the expense, the \$/MO column is where you enter the monthly cost of the expense (if you know it) and the \$/YR is where you enter the yearly cost of the expense (if you know it). Also note the right arrow (→) in the figure after property tax. The right arrow indicates what data

*“... this program only considers
the time and money factors
of the investment.”*

will be entered if you want to enter data. The right arrow can be moved around the menu by using the up arrow (↑), the down arrow (↓), the left arrow (←) and the right arrow (→) keys on the keyboard. Thus, if you want to enter cost of license, press the down arrow key until the right arrow is to the right of license on the CRT. If you wish to enter the monthly cost of licenses, simply enter the appropriate amount and press Enter when you are done. Note that when you enter the amount, you can use commas if you want. When you have entered the last digit of the amount, press Enter. Now note that the menu is reprinted with the amount you entered in the \$/MO column and also note that the computer has calculated the \$/YR and filled in that column. Also observe that the computer has added the \$/MO and \$/YR amounts to the total fixed expenses.

If you know the \$/YR instead of the \$/MO, press the right arrow key (→) to move the arrow to the \$/YR column. Then enter the cost per year. The computer will calculate the monthly cost for you.

Data entered on page two are the same as for page one.

Page three requires that you enter information on the number of units and the monthly rent per unit. The computer calculates the yearly rent for you. You can not enter the yearly rent. You must enter the monthly rent. Be sure to enter the allowance for vacancies. Note that this is entered as a percent of the rental income and not a dollar amount. The computer will calculate the dollar amount for you. Pages four and five have one column for data.

As soon as you press G, the computer starts the calculations. The first thing it does is check key input data to see if they are reasonable. If the data are not reasonable, the computer prints an error message and asks if you want to review the input information. Return to the appropriate page of the menu, review the data and make necessary corrections and then press G to begin calculations again.

If you do not wish to review the input data, press N and the computer will do the calculations. Sample results for the data given in Fig. 1 appear in Fig. 2.

When you use the program to analyze your own investments, remember that the computer calculations are based on the data you provided. If those data are bad, so is the calculated result.

Finally, remember that no matter what the computer results say, you are the one that has to decide if the investment is good or bad. Also remember that this program only considers the time and money factors of the investment. Consideration of risk and other factors is totally up to you. ■

Program continued

```

7250 PRINT"MONTHLY COST, THE COMPUTER WILL CALCULATE THE YEARLY
COST."
7260 PRINT"WHEN YOU HAVE ENTERED ALL THE DATA, PRESS 'G AND THE"

7270 PRINT"COMPUTER WILL BEGIN THE CALCULATIONS."
7280 PRINT"AFTER ALL CALCULATIONS ARE COMPLETED, THE COMPUTER WI
LL"
7290 PRINT"DISPLAY A SUMMARY OF THE RESULTS AND ASK IF YOU WANT"
7300 PRINT"TO SEE DETAILS. A HARD COPY OPTION IS ALSO AVAILABL.E."
"
7310 PRINT STRING$(63,"=")
7320 PRINT"**** PRESS ANY KEY TO BEGIN ****"
7330 Y$=INKEY$:IF Y$=""THEN 7330 ELSE CLS
7340 RETURN
7350 REM INITIALIZE
7360 F(0)="$###,#####.##"
7370 F(1)="PROPERTY TAX ----- $###,#####.##"
7380 F(2)="INSURANCE ----- $###,#####.##"
7390 F(3)="LICENSE ----- $###,#####.##"
7400 F(4)="REPLACEMENT RESERVES ----- $###,#####.##"
7410 F(5)="OTHER FIXED EXPENSES ----- $###,#####.##"
7420 F(6)="TOTAL FIXED EXPENSES ===== $###,#####.##"
7430 F(7)="JANITOR ----- $###,###.##"
7440 F(8)="GARDNER ----- $###,###.##"
7450 F(9)="SOC. SECURITY & UNEMP --- $###,###.##"
7460 F(10)="GARBAGE COLLECTION ----- $###,###.##"
7470 F(11)="UTILITIES ----- $###,###.##"
7480 F(12)="SUPPLIES ----- $###,###.##"
7490 F(13)="MAINTENANCE ----- $###,###.##"
7500 F(14)="ADVERTISING ----- $###,###.##"
7510 F(15)="MANAGEMENT ----- $###,###.##"
7520 F(16)="FREE RENT (MGR JANITOR)-- $###,###.##"
7530 F(17)="OTHER OPERATING EXPENSES -- $###,###.##"
7540 F(18)="TOTAL OPERATING EXPENSES ===== $###,#####.##"
7550 REM LABELS FOR TYPE OF UNITS
7560 REM IF YOU HAVE DIFFERENT TYPES OF UNITS CHANGE THE
7570 REM DATA STATEMENTS BEGINNING AT LINE 7930
7580 REM BE SURE TO TYPE END FOR THE LAST ITEM IN THE DATA LIST
7590 REM THE DATA LIST WILL HANDLE UP TO 12 DIFFERENT TYPE
7600 REM OF UNITS
7610 REM A TYPE OF UNIT IS FOR EXAMPE 1 BEDROOM FURNISHED
7620 REM LISTED AS 1 BED FUR
7630 FOR J = 1 TO 12
7640 READ FT(J)
7650 IF FT(J) = "END" THEN 7670
7660 NEXT J
7670 NT = J - 1
7680 F(19) = "PURCHASE PRICE OF PROPERTY ----- $###,#####.##"
7690 F(20) = "AMOUNT OF DOWN PAYMENT ----- $###,#####.##"
7700 F(21) = "AMOUNT OF FIRST MORTGAGE ----- $###,#####.##"
7710 F(22) = "INTEREST RATE FIRST MORTGAGE % PER YR --- ##.##%"
7720 F(23) = "LIFE OF FIRST MORTGAGE YEARS ----- ##"
7730 F(24) = "NUMBER OF PAYMENTS PER YEAR ----- ##"
7740 F(25) = "AMOUNT OF SECOND MORTGAGE ----- $###,#####.##"
7750 F(26) = "INTEREST RATE SECOND MORTGAGE % YR ----- ##.##%"
7760 F(27) = "LIFE OF SECOND MORTGAGE YEARS ----- ##"
7770 F(28) = "NUMBER OF PAYMENTS PER YEAR ----- ##"
7780 F(29) = "CLOSING COSTS ----- $###,#####.##"
7790 F(30) = "OTHER COSTS OF BUYING ----- $###,#####.##"
7800 F(31) = "LIFE OF INVESTMENT YEARS ----- ##"
7810 F(32) = "LIFE OF PROP FOR DEPRECIATION YEARS ----- ##"
7820 F(33) = "PER CENT OF VALUE DUE TO LAND ----- ##.##%"
7830 F(34) = "ESCLATION RATE FOR PROPERTY %/YR----- ##.##%"
7840 F(35) = "ESCLATION RATE FOR RENT INCREASES ----- ##.##%"
7850 F(36) = "ESCLATION RATE FOR EXPENSE INCREASES --- ##.##%"
7860 F(37) = "COSTS OF SELLING PROPERTY % OF PRICE ----- ##.##%"
7870 F(38) = "DISCOUNT RATE % ----- ##.##%"
7880 F(39) = "MARGINAL INCOME TAX RATE % ----- ##.##%"
7890 F(40) = "TAX RATE FOR CAPITAL GAINS %----- ##.##%"
7900 F(41) = "ALLOWANCE FOR VACANCIES AS % OF RENTS -- ##.##%"
7910 RETURN
7920 REM *****
7930 REM DATA STATEMENTS FOR TYPE OF APARTMENTS
7940 DATA 1 BED FUR, 1 BED UNFUR, 2 BED FUR, 2 BED UNFUR
7950 DATA 3 BED FUR, 3 BED UNFUR, END

```

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A software real estate information library.

The House Detective

Program Listing 1

```

10 *PROGRAM BY JOHN COMINIO
20 *VERSION 1.5 JUNE 17,1981 ** CASSETTE VERSION **
30 DEFINT A,C,E-O,Q-Z
40 CLEAR 6800
50 X=100: DIM H$(X), P(X), W$(X), PO$(X), S$(X), B(X), BA(X), T(X): H1=X
60 ON ERROR GOTO 1410
70 B=1:L=1:V=1:X=0
80 J=0:CLS:PRINT TAB(12)"REAL ESTATE INFORMATION LIBRARY":PRINT
90 PRINT TAB(5)"(1) -- CREATE FILES":PRINT TAB(5)"(2) -- SEARCH FI
LES":PRINT TAB(5)"(3) -- VIEW STORED FILES":PRINT TAB(5)"(4) -- SA
VE ON CASSETTE":PRINT TAB(5)"(5) -- LOAD FROM CASSETTE":PRINT TAB(
5)"(6) -- CHANGE FILE":PRINT TAB(5)"(7) -- DELETE FILE"
100 PRINT TAB(5)"(8) -- INSERT FILE":PRINT TAB(5)"(9) -- CLEAR FIL
ES IN MEMORY"
110 R$="" : PRINT @76B, "" : PRINT CHR$(30) : A=0: INPUT "COMMAND"; R$: A=V
AL(R$) : IFA=0 THEN 110
120 IFA<1 OR A>9 THEN 110
130 ON AGO TO 140, 890, 300, 460, 540, 630, 820, 1310, 1590
140 CLS:PRINT TAB(10)"FILE NUMBER"; B;" == TO EXIT TYPE '##' ==": P
RINT
150 PRINT @12B, "" : PRINT CHR$(30) : H$(B)="" : INPUT "ADDRESS? "; H$(B)
160 IF LEN(H$(B)) > 55 THEN H$(B) = LEFT$(H$(B), 55) : PRINT @12B, "" : PRINT
CHR$(30) : PRINT -- TO LONG -- SHORTENED AS FOLLOWS " : FORR=1 TO 5
00 : NEXT R : PRINT @12B, "" : PRINT CHR$(30) : PRINT "ADDRESS" : PRINT @136,
H$(B) :
170 IF H$(B) = "##" AND FL=1 THEN 150
180 IF H$(B) = "" THEN 150
190 IF H$(B) = "##" THEN H$(B) = "" : X=1 : GOTO 80
200 R$="" : PRINT @192, "" : PRINT CHR$(30) : P(B)=0 : INPUT "PRICE"; R$: P(
B)=VAL(R$) : IF P(B)=0 THEN 200
210 PRINT @256, "" : PRINT CHR$(30) : W$(B)="" : INPUT "WATERFRONT (O/R/
C/N)"; W$(B)
220 IF W$(B) = "O" OR W$(B) = "R" OR W$(B) = "C" OR W$(B) = "N" THEN 230 ELSE 210
230 PRINT @320, "" : PRINT CHR$(30) : PO$(B)="" : INPUT "POOL (Y/N)"; PO$(
B)
240 IF PO$(B) = "Y" OR PO$(B) = "N" THEN 250 ELSE 230
250 S$(B)="" : INPUT "LOT SIZE"; S$(B)
260 R$="" : PRINT @44B, "" : PRINT CHR$(30) : B(B)=0 : INPUT "NUMBER OF BE
DROOMS"; R$: B(B)=VAL(R$) : IF B(B)=0 THEN 260
270 R$="" : PRINT @512, "" : PRINT CHR$(30) : BA(B)=0 : INPUT "NUMBER OF B
ATHROOMS"; R$: BA(B)=VAL(R$) : IF BA(B)=0 THEN 270
280 IF FL=1 THEN RETURN ELSE FL=0
290 B=B+1 : GOTO 140
300 IF X=0 THEN B=O ELSE X=1
310 IF H$(X)="" THEN X=X+1
320 IF X>B-1 THEN 430
330 CLS:PRINT TAB(10)"FILE NUMBER"; X;" == TO EXIT TYPE '#' ==": PRI
NT TAB(24)" == HIT 'ENTER' TO CONTINUE =="
340 PRINT "ADDRESS -- "; H$(X)
350 PRINT "PRICE -- "; P(X)
360 IF LEFT$(W$(X), 1) = "O" THEN Y$ = "OCEAN" ELSE IF LEFT$(W$(X), 1) = "C" TH
EN Y$ = "CANAL" ELSE IF LEFT$(W$(X), 1) = "R" THEN Y$ = "RIVER" ELSE Y$ = "NO"
370 PRINT "WATERFRONT -- "; Y$
380 IF LEFT$(PO$(X), 1) = "Y" THEN Y$ = "YES" ELSE Y$ = "NO"
390 PRINT "POOL -- "; Y$
400 PRINT "LOT SIZE -- "; S$(X)
410 PRINT "NUMBER OF BEDROOMS -- "; B(X)
420 PRINT "NUMBER OF BATHROOMS -- "; BA(X)
430 A$ = INKEY$: IFA$ = "#" THEN B0
440 IFA$ = CHR$(13) AND X<B-1 THEN X=X+1 : GOTO 310

```

Program continues

John Cominio
626 Tortoise Way
Satellite Beach, FL 32937

If you work at a real estate office you probably know what a hassle it is to dig through page after page of listings to find a house for a customer. I have written a program to store, edit and search files containing specific information on houses.

When you finish entering the program and run it, the computer will display a menu showing all options available to you:

- Create files. This allows you to enter information about a house. You can store the address, price, waterfront (ocean, river, canal or not waterfront), pool (yes or no), lot size, number of bedrooms and the number of bathrooms (see Table 1). Each block of information is considered one file and with 16K, 100 files can be maintained in memory.

- Search files. This allows you to enter the specifications of a house you want the computer to search for. The specifications are as general or specific as you care to make them. You are asked for a price range, waterfront (yes or no), pool (yes or no), number of bedrooms, and number of bathrooms. After you have entered the desired information, the computer will search for all houses in memory which have those qualifications. And if you have a printer it will print them out (provided you tell it to).

- View stored files. This option allows you to look at all the houses currently in memory. To advance the listing, press Enter, or to exit, press the # key. This option is designed as a check to let you see if you have correctly entered the information.

"A compress program removes all spaces so it uses less memory and it runs faster."

H\$(x)—Address
 P(x)—Price
 W\$(x)—Waterfront (o/r/c/n)
 PO\$(x)—Pool (y/n)
 S\$(x)—Lot size
 B(x)—Number of bedrooms
 BA(x)—Number of bathrooms
 B—Current file number
 H1—Maximum number of files
 Q—District number

Table 1. Important Variables.

• Save on cassette. This will save all files onto a cassette. You are prompted to enter a district number corresponding to the houses you have stored in memory.

• Load from cassette. This will read in files from a cassette that were previously saved. It will print the district number for that tape on its initial read of data.

• Change file. If you have made a mistake while entering information, this option will let you correct it. You are asked for the file number you want to change and once this is entered, you may begin to correct it.

• Delete file. It does just that: You enter a file number and it erases that file. However, if you are viewing files and it jumps from file six to file eight, it is because you have deleted file seven.

• Insert file. This will allow you to insert a file only if you have previously deleted that file. This was designed to be used if you sell a house and erase its file. Then you can insert a new file in its place. If any files are open the program will tell you.

• Clear all files in memory. This erases all information that is in memory. When you enter this command you will be asked if you are sure, a precaution against accidentally wiping out all of your files. If you answer N you will return to the menu with all your files intact.

The actual program is about 7.5K of code, although it uses all 16K of memory. The additional 9.5K is cleared and dimensioned for use as file space. If you own a 32K or 48K system, change lines 30 and 50 to increase the number of files that can be handled in memory at one time.

You may have noticed there are no spaces in the program. I used a compress program to remove them all. By doing this the program uses less memory and it runs faster. I would suggest that you type it in without any spaces also.

There are many error trapping routines used throughout the program. If you try to view or search the files while none are in memory, you will be returned to the menu. ■

Program continued

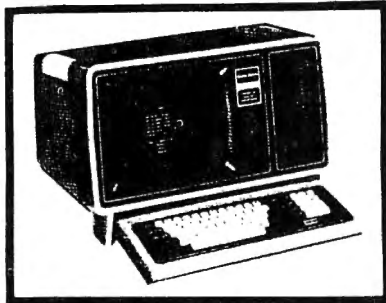
```

450 GOTO430
460 IFB=1THEN80
470 R$="": INPUT"DISTRICT NUMBER"; Q
480 PRINT"SAVING";
490 PRINT#-1, Q, B
500 FORT=1TOB+2STEP3
510 PRINT#-1, H$(T); ", "; H$(T+1); ", "; H$(T+2); ", "; P(T); ", "; P(T+1); ", ";
  P(T+2); ", "; W$(T); ", "; W$(T+1); ", "; W$(T+2); ", "; PO$(T); ", "; PO$(T+1); ", ";
  PO$(T+2); ", "; S$(T); ", "; S$(T+1); ", "; S$(T+2); ", "; B(T); ", ";
  B(T+1); ", "; B(T+2); ", "; BA(T); ", "; BA(T+1); ", "; BA(T+2)
520 NEXTT
530 GOTO80
540
550 A1=B: INPUT#-1, Q, B
560 PRINT"DISK FOR DISTRICT"; Q
570 R$="": PRINT@896, " "; PRINTCHR$(30); INPUT"CONTINUE"; R$; ILEFT
  $(R$, 1)="N" THENB=A1: GOTO80ELSEIFLEFT$(R$, 1)="Y" THEN580ELSE570
580 PRINT"LOADING";
590 FORT=1TOBSTEP3
600 INPUT#-1, H$(T), H$(T+1), H$(T+2), P(T), P(T+1), P(T+2), W$(T), W$(T+1),
  W$(T+2), PO$(T), PO$(T+1), PO$(T+2), S$(T), S$(T+1), S$(T+2), B(T),
  B(T+1), B(T+2), BA(T), BA(T+1), BA(T+2)
610 NEXTT
620 X=1: GOTO80
630 CLS: P=0: PRINTTAB(25) "CHANGE FILE": PRINT
640 R$="": PRINT@128, " "; PRINTCHR$(30); INPUT"WHICH FILE DO YOU W
  ANT CHANGED (-1 TO EXIT)"; R$; IFR$="" THEN640ELSEP=VAL(R$)
650 IFP<1ORP>H1THEN80
660 IFH$(P)="" THEN80
670 IFP>B-1THEN80
680 GOTO1520
690 ONRGOTO700, 730, 740, 760, 780, 790, 800
700 R$="": PRINT@896, " "; PRINTCHR$(30); INPUT"NEW ADDRESS? "; R$; I
  FR$="" THEN700ELSEH$(P)=R$
710 IFLEN(H$(P))>55THENH$(P)=LEFT$(H$(P), 55): PRINT@896, " "; PRINT
  CHR$(30); PRINT" -- LINE TO LONG SHORTENED AS FOLLOWS --"; FORR=
  1TO500: NEXTR: GOTO1520
720 F2=1: GOTO1520
730 R$="": PRINT@896, " "; PRINTCHR$(30); INPUT"NEW PRICE"; R$; P(P)=
  VAL(R$); IFP(P)=0THEN730ELSEF2=1: GOTO1520
740 PRINT@896, " "; PRINTCHR$(30); INPUT"WATERFRONT (O/R/C/N)"; W$(
  P)
750 IFW$(P)="" ORW$(P)="R" ORW$(P)="C" ORW$(P)="N" THENF2=1: GOTO152
  0ELSE740
760 PRINT@896, " "; PRINTCHR$(30); INPUT"POOL (Y/N)"; PO$(P)
770 IFPO$(P)="" ORPO$(P)="N" THENF2=1: GOTO1520ELSE760
780 PRINT@896, " "; PRINTCHR$(30); INPUT"NEW LOT SIZE"; S$(P); F2=1:
  GOTO1520
790 R1$="": PRINT@896, " "; PRINTCHR$(30); INPUT"NEW NUMBER OF BEDR
  OOMS"; R1$; B(P)=VAL(R1$); IFB(P)=0THEN790ELSEF2=1: GOTO1520
800 R2$="": PRINT@896, " "; PRINTCHR$(30); INPUT"NEW NUMBER OF BATH
  ROOMS"; R2$; BA(P)=VAL(R2$); IFBA(P)=0THEN800ELSEF2=1: GOTO1520
810 GOTO80
820 CLS: PRINTTAB(15) "DELETE A FILE"
830 INPUT"WHICH FILE DO YOU WANT DELETED (TYPE -1 TO EXIT)"; P
840 IFP<1ORP>H1THEN80
850 IFP>B-1THENPRINT"NO SUCH FILE": FORS=1TO1000: NEXT: GOTO80
860 IFP>B-1THENB=B-1
870 H$(P)="" : P(P)=0: W$(P)="" : PO$(P)="" : S$(P)="" : B(P)=0: BA(P)=0
880 PRINT"FILE"; P; "DELETED": FORS=1TO1000: NEXT: GOTO80
890 IFH$(1)="" THEN80ELSEV=1: L=1: W=B: DH=0: DL=0: CLS: PRINT"SEARCH T
  HROUGH FILES": PRINT
900 FORK=1TOW: T(K)=0: NEXT
910 PRINT"PRICE RANGE: "
920 PRINT@192, " "; PRINTCHR$(30); INPUT"FROM"; R$; DL=VAL(R$); IFDL=
  0THEN920
930 PRINT@256, " "; PRINTCHR$(30); INPUT" TO "; R$; DH=VAL(R$); IFDH=
  0THEN930
940 IFDL>DHTHEN920
950 PRINT@320, " "; PRINTCHR$(30); INPUT"WATERFRONT (Y/N)"; Y$
960 IFY$="" ORY$="N" THEN970ELSE950
970 PRINT@384, " "; PRINTCHR$(30); INPUT"POOL (Y/N)"; Y1$
980 IFY1$="" ORY1$="N" THEN990ELSE970
990 PRINT@448, " "; PRINTCHR$(30); PRINT"NUMBER OF BEDROOMS: "; INP
  UT"FROM"; R$; B1=VAL(R$); IFB1=0THEN990
1000 PRINT@576, " "; PRINTCHR$(30); INPUT" TO"; R$; B2=VAL(R$); IFB2
  =0THEN1000
1010 IFB1>B2THEN990
1020 PRINT@640, " "; PRINTCHR$(30); PRINT"NUMBER OF BATHROOMS: "; IN

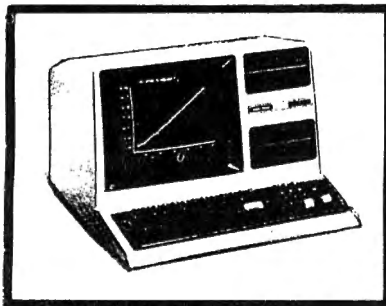
```

Program continues

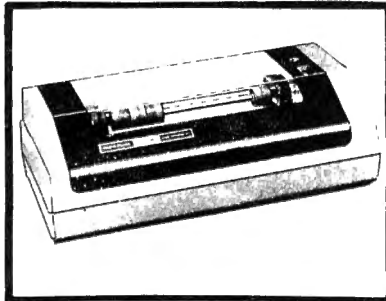
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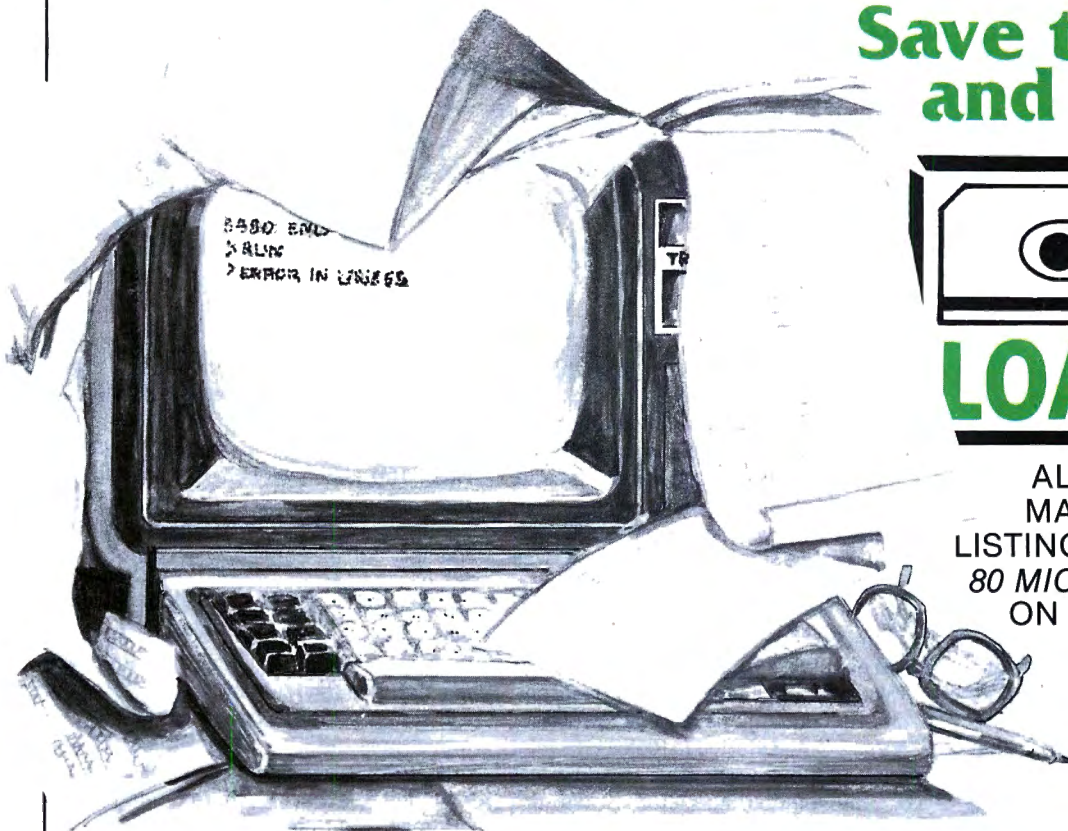
Program continued

```

PUT "FROM";R#:BA=VAL(R#);IFBA=OTHEN1020
1030 PRINT@768,"";:PRINTCHR$(30);:INPUT TO";R#:BB=VAL(R#);IFBB
=OTHEN1030
1040 IFBA>BBTHEN1020
1050 IFW$(L)="O"THENZZ$="Y"ELSEIFW$(L)="R"THENZZ$="Y"ELSEIFW$(L)
="C"THENZZ$="Y"ELSEZZ$="N"
1060 IFP(L)>=DLANDP(L)<=DHANDZZ$=Y#ANDPO$(L)=Y1#ANDB(L)>=B1ANDB(L)
<=B2ANDB(L)>=BAANDB(L)<=BBTHEN1080
1070 L=L+1;IFL>WTHEN1090ELSE1050
1080 T(V)=L;V=V+1;L=L+1;GOTO1050
1090 CLS:PRINT"SEARCH COMPLETED";IF(V-1)=OTHENI$="ARE";IH$="HOUS
ES"
1100 IF(V-1)>1THENI$="ARE";IH$="HOUSES"
1110 IF(V-1)=1THENI$="IS";IH$="HOUSE"
1120 PRINT"HERE ";I$;V-1;IH$;" WITH THOSE SPECIFICATIONS"
1130 IFT(1)=OTHENFORM=1TO4000;NEXT;GOTOBOELSE1140
1140 R$="";:PRINT@128,"";:PRINTCHR$(30);:INPUT"READY (Y/N)";R#:R$
=LEFT$(R$,1);IFR$="N"THENBOELSEIFR$="Y"THEN1150ELSE1140
1150 CLS
1160 FORU=1TOV-1
1170 PRINT"HOUSE";U;"OUT OF";(V-1):PRINT"PRESS 'ENTER' TO CONTIN
UE";PRINT
1180 PRINT"ADDRESS -- ";H$(T(U))
1190 PRINT"PRICE --";P(T(U))
1200 IFW$(T(U))="O"THENY$="OCEAN"ELSEIFW$(T(U))="R"THENY$="RIVER"
ELSEIFW$(T(U))="C"THENY$="CANAL"ELSEY$="NO"
1210 PRINT"WATERFRONT POPERTY -- ";Y$
1220 IFPO$(T(U))="Y"THENY$="YES"ELSEY$="NO"
1230 PRINT"POOL -- ";Y$
1240 PRINT"LOT SIZE -- ";S$(T(U))
1250 PRINT"NUMBER OF BEDROOMS -- ";B(T(U))
1260 PRINT"NUMBER OF BATHROOMS -- ";BA(T(U))
1270 A$=INKEY$;IFA$=""THEN1270
1280 IFA$=CHR$(13)THENCLS:NEXTUELSE1270
1290 PRINT@0,"";:PRINTCHR$(30);:INPUT"DO YOU WANT A PRINTOUT (Y/
N) ";P1$
1300 IFLEFT$(P1$,1)="N"THENBOELSEIFLEFT$(P1$,1)="Y"THEN1420ELSE1
290
1310 IFB-1=OTHENBOELSECLS:PRINTTAB(15)"INSERT FILE";PRINT
1320 PRINT"OPEN FILES: ";:FORC=1TOB-1
1330 IFH$(C)=""THENPRINTC;:J=1
1340 NEXTC
1350 IFC=BANDJ=OTHENPRINT"NONE OPEN";:FORC=1TO1500;NEXTC;GOTOBO
1360 PRINT
1370 INPUT"WHICH FILE NUMBER (-1 TO EXIT)";P
1380 IFP<1ORP>H1THENBO
1390 IFP>B-1THENBO
1400 IFH$(P)=""THENPRINT@192,CHR$(30);:FL=1;Q=B;B=P;GOSUB150;B=Q
;FL=0;GOTOBOELSEBO
1410 PRINT@832,CHR$(30);:FORC=1TO5:PRINT@832,"** ERROR **";:FORC1
=1TO150;NEXTC1:PRINT@832,CHR$(30);:FORC1=1TO150;NEXTC1;NEXTC;RES
UMEBO
1420 IFPEEK(14312)>127THENPRINT"PRINTER NOT READY";GOTO1290ELSEP
RINTTAB(25)"PRINTING"
1430 LPRINT"FORMAT: (ADDRESS) (PRICE) (WATERFRONT) (POOL) (L
OT SIZE) (# OF BEDROOMS) (# OF BATHROOMS)"
1440 LPRINTSTRING$(64,"-")
1450 FORU=1TOV-1
1460 IFW$(T(U))="O"THENY$="OCEAN"ELSEIFW$(T(U))="R"THENY$="RIVER"
ELSEIFW$(T(U))="C"THENY$="CANAL"ELSEY$="NOT WATERFRONT"
1470 IFPO$(T(U))="Y"THENY1$="YES POOL"ELSEY1$="NO POOL"
1480 LPRINT("";H$(T(U));") ";:LPRINT("";P(T(U));") ";:LPRINT("
";Y$;") ";:LPRINT("";Y1$;") ";:LPRINT("";S$(T(U));") ";:LPRIN
T("";B(T(U));") ";:LPRINT("";BA(T(U));") "
1490 LPRINTSTRING$(64,"-")
1500 NEXTU
1510 GOTOBO
1520 CLS:PRINTTAB(20)"CHANGE FILE";PRINT;IFPO$(P)="Y"THENQ1$="YE
S"ELSEQ1$="NO"
1530 IFW$(P)="O"THENQ$="OCEAN"ELSEIFW$(P)="R"THENQ$="RIVER"ELSEI
FW$(P)="C"THENQ$="CANAL"ELSEQ$="NO"
1540 R$=CHR$(94)+" ";:PRINT(1) -- ADDRESS ";R#;H$(P);:PRINT(2) --
PRICE ";R#;P(P);:PRINT(3) -- WATERFRONT ";R#;Q$;:PRINT(4) -- P
OOL ";R#;Q1$;:PRINT(5) -- LOT SIZE ";R#;S$(P);:PRINT(6) -- NUMBE
R OF BEDROOMS ";R#;B(P);:PRINT(7) -- NUMBER OF BATHROOMS ";R#;BA
(P)
1550 IFF2=1THEN1570
1560 A$="";:PRINT@896,"";:PRINTCHR$(30);:INPUT"WHICH NUMBER (1-7)
";A$;IFA$=""THEN1560ELSER=VAL(A$);IFR<1ORR>7THEN1560ELSE690
1570 F2=0;A$="" ;:PRINT@896,"";:PRINTCHR$(30);:INPUT"MORE CORRECT
IONS (Y/N)";A$;A$=LEFT$(A$,1);IFA$="" THEN1570
1580 IFA$="Y"THEN1560ELSEIFA$="N"THENBOELSE1570
1590 A$="";:PRINT@768,"";:PRINTCHR$(30);:INPUT"ARE YOU SURE (Y/N)
";A$;A$=LEFT$(A$,1)
1600 IFA$="N"THENBOELSEIFA$="Y"THEN1610ELSE1590
1610 FORR=1TOX
1620 H$(R)="" ;:P(R)=0;W$(R)="" ;:PO$(R)="" ;:S$(R)="" ;:B(R)=0;BA(R)=0
1630 NEXTR;B=1;L=1;V=1;X=0;GOTOBO
  
```

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Wayne Green
Publisher, *80 Microcomputing*

A handwritten signature in cursive script that reads "Wayne Green".

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A Driven Printer

Wayne Mueller
130 Sunset Court
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Recently my Selectric printer was stolen. Since I need a letter-quality printer, I thought about another Selectric. But then I thought about how slow, noisy, and how much the old Selectric needed to be readjusted. I finally settled on an NEC 5530 Spinwriter. I knew it was faster, quieter and more reliable. And since it had a Centronics interface, I could "plug in and print," and forget about those nuisance driver routines I had to use with the Selectric.

But after loading Basic and typing in a few lines of LPRINTs, all the lines printed on top of each other! When all else fails, read the manual. Sure enough, the manual says that when a carriage return is received, the carriage returns . . . nothing about a trailing

line feed. Well, so much for my belief that no drivers were needed.

There are actually some advantages to a nonautomatic line feed following a carriage return. For example, Software Concepts has a slick mail processing system that supports both underscores and bold-face characters on such printers, and I was tempted to just leave well enough alone. But then I realized that Scripsit's line feed and paragraph spacing was off by one, that I could not get a printout from the editor/assembler, and that nearly all of my Basic programs were going to have to be reworked.

At this point, it started to look a lot easier to write a little driver routine to add a line feed after each carriage return. It did turn out that I needed more than one driver. This article may benefit a few others who find themselves in the same fix.

Look at Program Listing 1. The TRS-80 has several device control blocks (DCBs). The DCB which starts at 4025H is normally

used for the line printer. So, what we are doing at lines 130-150 is telling the machine that we have a line printer (line 140), and the address of the driver routine is labeled Busy. The assembler can determine the correct numeric address from the label. At lines 160-170, we are protecting some high memory for this driver. The TRS-80 stores the end of unprotected memory in 4049H. What we told the assembler here was that we wanted unprotected memory to end two words less than Busy. Again, the assembler is smart enough to do the arithmetic to find the actual address. Notice that we have not moved any data yet. If just this part were loaded, that would be sufficient to tell the machine to expect a different printer-driver address, and to protect high memory.

The Driver

The ORG at line 180 says we want the driver to start at FF50H, or 65360 decimal. If you want it somewhere else, or have a smaller machine, use some other value. For example, 7F50H (32592 decimal) would work well on a 16K machine. The printer port on the TRS-80 is mapped to 37E8H. Line 300 gives us the printer status. The printer returns to its state of readiness to receive characters to this address. Between lines 300-330, we are looking for a printer ready signal. If it is not ready, we keep looping back to Busy at line 300. When we get to line 340, the printer is ready to accept a character.

The next character comes to us in register C, just because that is where the machine puts it. So we load it into register A at 340, and send it to the printer port at line 350.

Up to here we have not done anything differently from the standard ROM driver. But now is when we take care of the needed line feed. The last character is still in register C, so we load it again at line 360, and see if it was a carriage return at line 370. If not, we are done, and we return control to whatever routine called us. If it was a carriage return, we load a line feed into register C at line 390, and jump back to the start of the driver (Busy) at line 400. This driver takes care of

```

00100 ;GENERAL HI-MEM NEC SPINWRITER DRIVER
00110 ;WITH SCREEN DISPLAY INCLUDED
4467 00120 DISPLA EQU 4467H ;DOS DISPLAY CALL
4025 00130 ORG 4025H ;FIX PRINTER DCB TO:
4025 02 00140 DEFB 2 ; -LOOK LIKE A PRINTER
4026 68FF 00150 DEFW BUSY ; -HOLD NEW DRIVER ADDRESS
4049 00160 ORG 4049H ;SET MEMORY PROTECT
4049 66FF 00170 DEFW BUSY-2 ; TO JUST BELOW THIS DRIVER
FF50 00180 ORG 0FF50H ;** OR USE WHATEVER OTHER START
00190 ; LOCATION IS RIGHT
00200 ; FOR YOUR SIZE MACHINE **
FF50 E5 00210 START PUSH HL ;SAVE HL
FF51 2159FF 00220 LD HL,MSG ;POINT TO START OF MESSAGE
FF54 CD6744 00230 CALL DISPLA ;CALL DOS TO DISPLAY MESSAGE
FF57 E1 00240 POP HL ;RESTORE HL
FF58 C9 00250 RET ;AND RETURN
00260 ;OR JUMP TO DOS (402DH) IF YOU PREFER
FF59 4E 00270 MSG DEFM 'NEC DRIVER ON' ; TEXT OF DISPLAY
FF66 0D 00280 DEFB 0DH ;CARRIAGE RETURN AFTER MSG
FF67 00 00290 DEFB 0 ;END OF MESSAGE
FF68 3AE837 00300 BUSY LD A,(37E8H) ;GET PRINTER STATUS
FF6B E6F0 00310 AND 0F0H ;GET UPPER
FF6D FE30 00320 CP 30H ; PART OF STATUS WORD
FF6F 20F7 00330 JR NZ,BUSY ; KEEP TRYING IF NOT READY
FF71 79 00340 LD A,C ;GET CHARACTER TO PRINT
FF72 32E837 00350 LD (37E8H),A ;CHARACTER TO PRINTER
FF75 79 00360 LD A,C ;TAKE ANOTHER LOOK AT CHARACTER
FF76 FE0D 00370 CP 0DH ;IS IT CARRIAGE RETURN?
FF78 C0 00380 RET NZ ;IF NOT, WE'RE DONE
FF79 0E0A 00390 LD C,0AH ; IF SO, LOAD LINE FEED,
FF7B 18EB 00400 JR BUSY ; AND OUTPUT IT
FF50 00410 END START ;AUTO START

```

Program Listing 1

"I find it disquieting when I run a program, and nothing happens..."

almost all of our printing needs.

Program Listing 2

This is a bare bones, minimum routine. Specifically, I find it somewhat disquieting when I run a program, and nothing happens on the screen to confirm that it is working. Program Listing 2, is similar to Listing 1 and also displays a message to let us know it is working. The line numbers are the same as Listing 1, but we have added a few things in the empty spaces.

Notice line 120. There is a label called Display, which refers to a DOS routine at 4467H that displays text. Also notice that lines 210-290 are added. Lines 270-290 define the message, while 210-250 do the work. The text of the message "NEC Driver On" is at line 270, a following carriage return is at line 280, and the zero at line 290 simply tells DOS that this is the end of the message.

Now let's see how it is displayed. The HL register pair must point to the start of the message text, but HL may be in use for something else. So, we save HL at line 210 by PUSHing it onto the stack, point it to the beginning of the message at line 220, and call Display at line 230 to display the text on the screen. Finally, we restore HL to its previous condition by POPping it off the stack at line 240, and return to the calling routine. The only other change is at line 410. We have added the label Start after the end to tell the loader that we want to jump to Start automatically after loading the routine. These changes do not affect the printer driver, but now I can see something happening on the screen when I load the routine.

Other Annoyances

This takes care of almost all my printer driver needs but there are still a few annoyances that need attention. The first is Scripsit's behavior. Scripsit works fine until nearly all of the text buffer is full. Then it proceeds to overwrite my driver with text. Worse, it does not tell me until I try to print, which results in a spectacular crash, and a machine lockup.

The second item is those Basic programs that already protect high memory, and use the protected space for some other machine-language routine. Some of these other routines behave nicely if you just load the printer driver first, and the other routine just above it. But some of them use all of protected memory for their own purposes, and again overwrite my driver with unpleasant results.

Fortunately, Radio Shack offers some patch code that modifies Scripsit to work with a variety of non-Radio Shack printers.

Program Listing 3 is mostly Radio Shack's, with my driver embedded. Not all

of the Radio Shack code was used, because not all was needed. A few things in the patch code are worth noting. We see at lines 310-320, that Scripsit does not use the value stored at 4049H for memory protect. Rather, whatever you want to declare as protected memory must be stored in 5268H. This is why Scripsit used to overwrite my driver.

My driver runs from lines 560-680, and it looks a bit different from what we have discussed so far. The first thing we do at

line 560 is output a character from the A register. This is because Scripsit has already put the character in A, and checked to make sure the printer is ready. From here on, things start to look familiar. That is, we check to see if the last character was a carriage return, and output a line feed if it was. At line 620, the printer status checks again for line feed, so that Scripsit knows we want to print an extra character, and will check to see if the printer is ready.

Notice line 710. If you do not have lower-

```

00100 ;GENERAL HI-MEM NEC SPINWRITER DRIVER
4025 00130 ORG 4025H ;FIX PRINTER DCB TO:
4025 02 00140 DEFB 2 ; -LOOK LIKE A PRINTER
4026 50FF 00150 DEFW BUSY ; -HOLD NEW DRIVER ADDRESS
4049 00160 ORG 4049H ;SET MEMORY PROTECT
4049 4EFF 00170 DEFW BUSY-2 ; TO JUST BELOW THIS DRIVER
FF50 00180 ORG 0FF50H ;** OR USE WHATEVER OTHER START
; LOCATION IS RIGHT
; FOR YOUR SIZE MACHINE **
FF50 3AE837 00300 BUSY LD A,(37E8H) ;GET PRINTER STATUS
FF53 E6F0 00310 AND 0F0H ;GET UPPER
FF55 FE30 00320 CP 30H ; PART OF STATUS WORD
FF57 20F7 00330 JR NZ,BUSY ; KEEP TRYING IF NOT READY
FF59 79 00340 LD A,C ;GET CHARACTER TO PRINT
FF5A 32E837 00350 LD (37E8H),A ; CHARACTER TO PRINTER
FF5D 79 00360 LD A,C ;TAKE ANOTHER LOOK AT CHARACTER
FF5E FE0D 00370 CP 0DH ;IS IT CARRIAGE RETURN?
FF60 C0 00380 RET NZ ;IF NOT, WE'RE DONE
FF61 0E0A 00390 LD C,0AH ; IF SO, LOAD LINE FEED,
FF63 18EB 00400 JR BUSY ; AND OUTPUT IT
0000 00410 END

```

Program Listing 2

Program Listing 3

```

00100 ;THIS ROUTINE LOADS AND MODIFIES SCRIPSIT TO PERMIT
00110 ;USE OF YOUR OWN PRINTER DRIVER
00120 ;
00130 ;IT SHOULD BE LOCATED IN HIGH RAM.THIS EXAMPLE IS
00140 ;LOCATED AT 0FF60H FOR A 65 K MACHINE
00150 ;
FF60 00160 ORG 0FF60H
FF60 00170 PARLEL EQU 0FF60H ;ENTRY ADDRESS
FF60 E5 00180 PUSH HL
FF61 21E3FF 00190 LD HL,SWITCH ;TEST FOR 1ST CALL
FF64 34 00200 INC (HL)
FF65 35 00210 DEC (HL)
FF66 E1 00220 POP HL
FF67 2038 00230 JR NZ,PATCH ;GO IF NOT 1ST CALL
FF69 11E4FF 00240 LD DE,DCBADR ;DE=> FILE SPEC
FF6C CD3044 00250 CALL LOAD ;OPEN AND LOAD SCRIPSIT
FF6F CD2844 00260 CALL CLOSE ;CLOSE COMMAND FILE
FF72 3E01 00270 LD A,1 ;SET SWITCH TO SKIP THIS
FF74 32E3FF 00280 LD (SWITCH),A ;CODE ON FUTURE CALLS
FF77 3E21 00290 LD A,21H ;PATCH SCRIPSIT
FF79 326752 00300 LD (5267H),A ; TO PROTECT
FF7C 215FFF 00310 LD HL,PARLEL-1 ; THIS DRIVER
FF7F 226852 00320 LD (5268H),HL
FF81 323F66 00340 LD (663FH),A ; YOUR INIT. ROUTINE
FF84 3ECD 00350 LD A,0CDH ;PATCH SCRIPSIT TO RUN
FF86 329E7A 00360 LD (7A9EH),A ; YOUR DRIVER ROUTINE
FF89 32977A 00370 LD (7A97H),A
FF8C 21DFFF 00380 HL,INIT ;ADD OF INITIALIZATION
FF8F 224066 00390 LD (6640H),HL ; ROUTINE
FF92 2160FF 00400 LD HL,PARLEL ; ADDRESS OF YOUR DRIVER
FF95 229F7A 00410 LD (7A9FH),HL ; ROUTINE
FF98 22987A 00420 LD (7A98H),HL
FF9B C30052 00430 JP 5200H ; ENTER SCRIPSIT
FF9E ED43EDFF 00440 PATCH LD (SAV1),BC ; SAVE THE REGISTERS
FFA2 ED53EFFF 00450 LD (SAV2),DE
FFA6 22F1FF 00460 LD (SAV3),HL
FFA9 ED73F3FF 00470 LD (SAV4),SP
FFAD 32F5FF 00480 LD (SAV5),A

```

Program continued

"This means that we have to change a few pointers so List and Edit know where to look..."

Program continued

```

FFB0 CDC6FF 00490      CALL  OUTPUT
FFB3 ED4BEDFF 00500      LD    BC,(SAV1)      ; REPLACE THE REGISTERS
FFB7 ED5BEFFF 00510      LD    DE,(SAV2)
FFBB 2AF1FF 00520      LD    HL,(SAV3)
FFBE ED7BF3FF 00530      LD    SP,(SAV4)
FFC2 3AF5FF 00540      LD    A,(SAV5)
FFC5 C9 00550          RET
FFC6 32E837 00560      OUTPUT LD (37E8H),A      ;OUTPUT CHARACTER
                                00570 ;PRINTER STATUS IS OK--SCRIPSIT CHECKED FIRST
FFC9 3AF5FF 00580      LD    A,(SAV5)      ;TAKE ANOTHER LOOK
FFCC FE0D 00590      CP    0DH           ;IS IT CARRIAGE RETURN?
FFCE C0 00600          RET    NZ           ;IF NOT WE'RE DONE
FFCF 0E0A 00610      LD    C,0AH        ;PUT LINE FEED IN C,
FFD1 3AE837 00620      BUSY1 LD A,(37E8H)      ;GET PRINTER STATUS
FFD4 E6F0 00630      AND   0F0H        ;CHECK UPPER
FFD6 FE30 00640      CP    30H         ; PART OF STATUS BYTE
FFD8 20F7 00650      JR    NZ,BUSY1    ;IF BUSY KEEP TRYING
FFDA 79 00660          LD    A,C         ;PRINTER READY-GET LF IN A,
FFDB 32E837 00670      LD    (37E8H),A    ;AND OUTPUT IT.
FFDE C9 00680          RET           ;ALL DONE--BACK TO SCRIPSIT
FFDF C9 00690          RET           ;RETURN
FFE0 00 00700          SWITCH DEF 0 ;BUCKET TO STASH SWITCH
FFE1 53 00710          DCBADR DEF 1 'SCRIPSIT/LC' ; OR USE 'SCRIPSIT/UC'
FFEC 03 00720          DEF 3 ;MARK END OF FILESPEC
                                00730 ;
4430 00740          LOAD EQU 4430H ;CALL DOS TO LOAD FILE
4428 00750          CLOSE EQU 4428H ;CALL DOS TO CLOSE FILE
                                00760 ;
FFED 0000 00770          SAV1 DEF 0000 ;REGISTER SAVE AREA
FFEF 0000 00780          SAV2 DEF 0000
FFF1 0000 00790          SAV3 DEF 0000
FFF3 0000 00800          SAV4 DEF 0000
FFF5 00 00810          SAV5 DEF 00
FF60 00820          END   PARLEL

```

case, you would substitute Scrpsit/UC. Also notice lines 250-260 and 740-750. These refer to DOS calls which bring Scrpsit into memory, and close the file. This program loads Scrpsit; you don't have to.

The Last Problem Solved

There are some machine language routines you might want to use from Basic that treat all of protected memory as their exclusive domain. Sometimes another routine in high memory works, sometimes not. My approach was to relocate the Basic program text area upwards, and run the driver from where the Basic text used to be. This means that we have to change a few pointers, so routines like List and Edit know where to start looking, and CLOAD knows where to put what it is reading. The hardest part was finding the right pointers.

Program Listing 4 is similar to Listing 2. At lines 160-170, the assembler was instructed to determine the address two bytes beyond the label Last, and store that in 40A4H, which is where Load and CLOAD can determine where to start putting the

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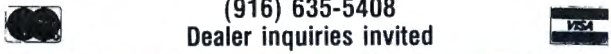
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"We are not protecting memory here because this routine is already protected."

text. At lines 180-190, we are changing the next available byte pointer to contain the address four bytes beyond Last. Line 200 instructs this routine to start where Disk Basic text used to start. If you want to use this for Level II Basic, set the ORG at 42E9H (17129 decimal). About the only other differences are the jump to Basic at line 250, and the zeros at Lines 400-420. Basic text is always terminated by a series of zeros, so that List and LLIST know where to stop.

There is one omission from Listing 2. We are not protecting memory here. That is because this routine is already protected by being in a place where other routines are not likely to interfere. You can protect high memory when you enter Basic and use all of it for whatever other machine language routines you might need.

The Spinwriter is a nice piece of equipment, and I'm thoroughly pleased with it, now that I have the software to drive it properly. ■

Cassette and disk versions of the listings in this article are available from the author.

```

00100 ;ROUTINE RELOCATES START OF BASIC PROGRAM TEXT, SO
00110 ;NEC SPINWRITER DRIVER CAN RESIDE IN LOW MEMORY.
4467 00120 DISPLA EQU 4467H ;DOS DISPLAY ROUTINE
4025 00130 ORG 4025H ;PRINTER DEVICE CONTROL BLOCK
4025 02 00140 DEFB 2 ; DESCRIBE AS PRINTER
4026 006A 00150 DEFW BUSY ; ADDR OF DRIVER=>4026
40A4 00160 ORG 40A4H ;CLOAD START POINTER
40A4 776A 00170 DEFW LAST+2 ; STASH END DRIVER +2
40F9 00180 ORG 40F9H ;NEXT FREE TEXT BYTE POINTER
40F9 796A 00190 DEFW LAST+4 ; STASH END DRIVER +4
6A46 00200 ORG 6A46H ;WHERE BASIC TEXT USED TO BE
6A46 E5 00210 START PUSH HL ;SAVE HL
6A47 21516A 00220 LD HL,MSG ;POINT TO MESSAGE
6A4A CD6744 00230 CALL DISPLA ;CALL DOS TO DISPLAY MESSAGE
6A4D E1 00240 POP HL ;RESTORE HL
6A4E C3191A 00250 JP 1A19H ;JUMP TO BASIC
6A51 4E 00260 MSG DEFM 'NEC DRIVER ON' ;MSG FOR DISPLAY
6A5E 0D 00270 DEFB 0DH ;CARRIAGE RETURN AFTER MSG
6A5F 00 00280 DEFB 0 ;END OF MESSAGE
6A60 3AE837 00290 BUSY LD A,(37E8H) ;GET PRINTER STATUS
6A63 E6F0 00300 AND 0F0H ; AND SEE
6A65 FE30 00310 CP 30H ; IF READY BIT IS OK
6A67 20F7 00320 JR NZ,BUSY ;IF NOT, KEEP CHECKING
6A69 79 00330 LD A,C ; ELSE GET CHARACTER TO PRINT
6A6A 32E837 00340 LD (37E8H),A ;AND OUTPUT TO PRINTER
6A6D 79 00350 LD A,C ;TAKE ANOTHER LOOK AT CHARACTER
6A6E FE0D 00360 CP 0DH ; IS IT CARRIAGE RETURN?
6A70 C0 00370 RET NZ ; IF NOT, WE'RE DONE
6A71 0E0A 00380 LD C,0AH ; IF SO, PUT LINE FEED IN C,
6A73 18EB 00390 JR BUSY ; AND KEEP GOING.
6A75 0000 00400 LAST DEFW 0000 ;TELL LIST, ETC WHERE TO QUIT
6A77 0000 00410 DEFW 0000 ; LOOKING FOR MORE
6A79 0000 00420 DEFW 0000
6A46 00430 END START ;AUTO START

```

Program Listing 4

Really, what can you do with a dual sided disk drive on a Model I? **Nothing** - without the *Dual Sided Disk Kit*. Using it you can put up to 3 of them on your system. You don't have 3 dual sided drives? Now you can add them - painlessly. This kit lets you mix dual and single head drives, in any combination. That's not all, 35-, 40-, 77-, and 80-track drives can be combined in any order.

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The only thing easier than using the *Dual Sided Disk Kit* is installing it. No tools are required. Just connect the new drive cable and press RESET - that's all. By the way, the same is true for any dual headed drives you add to your system - no drive modifications are needed - plug 'em in and go.

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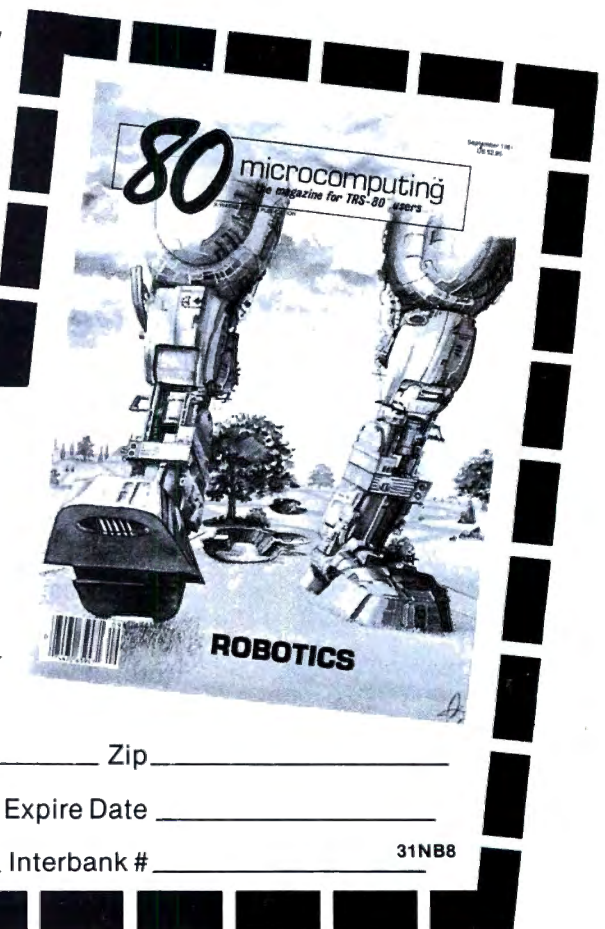


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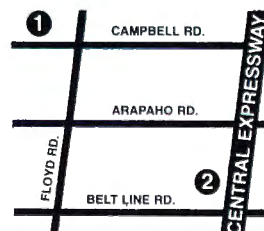
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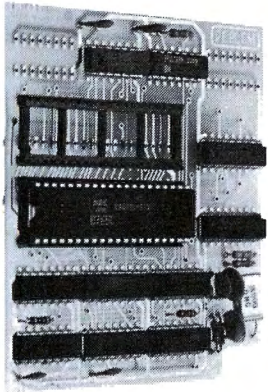
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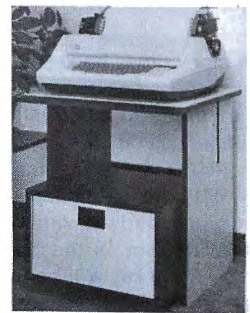


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How many times have you had troubles using the "special print" functions on your line printer from Scripsit? If you have ever experienced difficulties, I think you will appreciate the following modification to Scripsit. With this patch in place all you do when you are ready to print is press two keys. The first key is the print command "P". The second key will be for the special print feature you want. There's no need to reserve high memory and no special program to load except Scripsit.

Before you start this project, however, make sure you have the following:

- A backup copy of Scripsit in its original form. A copy with a block move routine appended to it will not work.
- A utility program that can access disk sectors and modify them like Apparat's Superzap or Small Software Systems' RSM-2D.
- An ability to write Z80 machine language instructions.

I am assuming that a backup of the original Scripsit disk will be the same regardless of when or where the program was purchased. Radio Shack should not have moved the program around on the disk from

one production run to the next. So the first precaution to take before you make any changes is to check your sector dumps with the ones I show and make sure they match.

Printer Commands

Before you make any modifications to the disk, customize the Program Listing to fit your printer characteristics. That is why you must be familiar with the Z80 instruction set. The listing is the program that I use with my printer, the Epson MX-80. The following information will help you modify the program to accommodate your printer.

First decide what features in your printer you would like to access from Scripsit. I had four types of printing I wanted to use, but I was only able to incorporate two. Here is why: When the Epson printer is programmed for expanded printing, 40 characters per line, it will default to its normal 80 characters per line every time a line feed/carriage return is sent to the printer. To continue printing in the expanded mode the appropriate command must be sent preceding every line. This trick was a little more than I could handle inside a machine language program like Scripsit, so I dropped this mode from my list. Once you have decided on the commands you want, check to make sure they will not default when a line feed/carriage return is transmitted to the printer.

Program Modifications

Having made the decision about which printer commands you want, convert their decimal values to hex numbers (all references to hex numbers in this article will be followed by a capital H). For instance, if you want to print in the compressed mode, 132 characters per line, send a CHR\$(15) to the printer. Decimal 15 converts to 0FH. If you

look at line 7AD0H of the listing, you will see that 0FH has been loaded into register C. The other mode included in the program is the double pass mode which causes the print head to print a line twice for a much darker appearance. This is accomplished by sending two commands to the printer, 1BH and 47H. Lines 7AD7H and 7ADCH are where these commands are loaded.

If you have a one-command feature in your printer that you want to use, then insert that command in line 7AD0H. Likewise, any two-command modes can be placed into lines 7AD7H and 7ADCH. If you have more commands to add, then you will have to modify the program. You can add up to 100 bytes before you run out of room.

You should be aware of the following steps if you decide to modify the program. Load all printer commands into register C before calling the subroutine which sends the command to the printer. When you add lines to the program, most if not all of the relative jumps will change. At the end of the program be sure to include the lines:

```
CD C9 70 CALL 70C9
C3 64 70 JP 7064
```

You may also want to change the prompts that the program places on your monitor. The program as it stands will place the letters C, D and N on the lower right side of the monitor. These letters stand for compressed, dark and normal. Lines 7AADH, 7AB2H and 7AB7H change these letters.

Disk Modifications

There will be four sectors on the disk that will be altered: two for Scripsit/UC and two for Scripsit/LC. I will start with the modifications on Scripsit/LC. If you are using Super-

"Now if this explanation has made any sense at all, the instructions to follow will be a snap."

zap, display track 0BH, sector 0. If you are using RSM-2D, load sector 110 to a convenient place in memory like 6000H. This is a good time for me to explain a term I will be using frequently—relative byte.

For RSM-2D users I am referring to the last two digits of a memory address. For instance, if you have just loaded the sector to location 6000H, and I mention relative byte DDH, you will be looking at 60DDH. If you have loaded the sector to another location, such as 4300H as an example, then you would be looking at 43DDH. In either case, relative byte DDH contains the same information.

With a Superzap dump, relative rows 00H through F0H are shown in the last two digits of the first column. For example, the first column of relative row D0H from Fig. 1 looks like this: 00B0D0.

To find relative byte DDH drop down to relative row D0H and count over, in hex, 14 places. Now if this explanation has made any sense at all, the instructions to follow will be a snap.

If track 0BH, sector 0 is displayed, compare your display with Fig. 1. Except for relative bytes DDH, DEH, and DFH, the underlined bytes, your display should look like Fig. 1. Relative bytes DDH, DEH, and DFH should be: CD C9 70. Modify these three bytes to read: C3 A5 7A.

This change causes Scripsit to jump to location 7AA5H—the location for our "Program the Printer" routine. The changes to this sector are complete. Save the sector back at its original location on the disk.

Next load track 0CH, sector 1. This is sector 121 for users of RSM-2D. Compare your dump with Fig. 2. Be very careful—a lot of changes take place in this sector. In Fig. 2 relative bytes 49H, 4AH, 4BH, and 4CH are underlined. All the hex code that follows relative byte 4CH to the end of the sector is just filler, it is not part of Scripsit. The underlined bytes tell the disk program loader that the end of Scripsit/LC has been reached (0202) and the next two bytes are the start of the program (0052), which is 5200H. These four bytes will be moved to the end of the sector. Modify the four bytes at relative positions FCH, FDH, FEH and FFH to read: 02 02 00 52. The lower right corner of Fig. 3 shows this change.

Next we want to tell the disk program loader that the end of the Scripsit program has been moved to the end of the sector. If you look at Fig. 3 you will see that relative bytes 49H, 4AH, 4BH and 4CH are underlined again but they contain a new code. The 01 tells the disk loader that there is more program to be loaded. The B1 tells the loader that there are 177 more bytes to be loaded, and A5 7A will direct these bytes to memory location 7AA5H. Insert the follow-

ing bytes at relative positions 49H, 4AH, 4BH and 4CH: 01 B1 A5 7A.

An additional 177 bytes within Scripsit is now available in which to insert our own program. Don't worry; the disk directory has always had this entire sector reserved for Scripsit. The additional 177 bytes at the end of Scripsit are protected when loaded into memory because the program scratch pad

memory starts at 7C00H.

All that remains now is to modify (or edit) the relative bytes beginning with 4DH with the program listing or one you have developed for your printer. After I inserted my program, I went ahead and zeroed out the remainder of the sector to make it easier to see the changes made to the sector. Once you have inserted your program, you can

```

00B000 C3C8 6BCD E96B ED5B 437C AF32 3A60 3256 .....C..:2V
00B010 603A 327C B728 07FD 3603 00CD 966D D5CD ..:2..(.6.....
00B020 3A6E CD7C 53D1 FDCB 348E CDA2 61C3 C052 ...S...4.....R
00B030 1054 4142 2043 4F4D 4D41 4E44 204D 4F44 .TAB.COMMAND.MOD
00B040 4513 5749 4E44 4F57 2043 4F4D 4D41 4E44 E.WINDOW.COMMAND
00B050 204D 4F44 4514 454E 5445 5220 5245 5045 .MODE.ENTER.REPE
00B060 4154 2043 4F4D 4D41 4E44 1752 4550 4541 AT.COMMAND.REPEA
00B070 5420 484F 5720 4D41 0102 0070 4E59 2054 T.HOW.MA...NY.T
00B080 494D 4553 3F20 1B44 454C 4554 4520 5041 IMES?.DELETE.PA
00B090 5241 4752 4150 4820 2859 204F 5220 4E29 RAGRAPH.(Y.OR.N)
00B0A0 3F20 2044 454C 4554 4520 544F 2045 4E44 ?.DELETE.TO.END
00B0B0 204F 4620 5445 5854 202B 5920 4F52 204E .OF.TEXT.(Y.OR.N
00B0C0 293F 2021 5274 CDC8 6BFD 3634 C0CD 8B70 )?.IR.....64....
00B0D0 CDC9 70FD CB34 B6CD E96B CD8B 70C3 A57A .....4.....
00B0E0 1B0E FD21 2F7C ED53 437C CD7C 6F31 FA41 ...1/.SC...1.A
00B0F0 FD36 3400 218B 6F22 297C 3A39 7C32 647C .64.1..")::9.2..

```

Fig. 1

```

00C100 CD24 6ED1 CDF4 52C3 706E 0000 0000 0000 .$.R.....
00C110 0000 3AB9 7CB7 2801 05C9 EB09 79B7 C825 .....(.....%
00C120 C9FE 8CCA 8371 FE8D C289 71C3 8371 2812 .....(.....(
00C130 FE0D 280E FE0A 280A 083E 2032 E837 08C3 ..((...>.2.7..
00C140 745F 32E8 37C3 745F 3B02 0200 525D 6E24 ..2.7...;R..$.
00C150 6E5F 6B50 6E18 6E64 7937 6FF3 6E26 6F18 ...P.....7...&
00C160 5583 5878 56FB 5442 6FB5 586A 58AD 6D46 U.X.V.TB..X.X..F
00C170 6426 6F18 55FB 545D 6E24 6EB9 542D 5505 .&.U.T..$.T-U.
00C180 0618 031C 1A6E 6D1D 6D55 6D2F 6D96 6D09 .....U./...
00C190 0601 9C9B 9E9D 1B8E 8D0E 6EFE 6D56 6EC7 .....V...
00C1A0 01A7 007A 6DE5 6D11 5463 54E5 6DC7 6D03 .....T.T.....
00C1B0 111A 034D 590E 59D2 5A3C 0C48 0159 4E4E ...MY.Y.Z<H.YNN
00C1C0 5959 0106 3C4E 4280 8034 1278 5621 ED5C YY.<NB..4..V1..
00C1D0 FD36 078F C9CD E96B C35D 5ACD FA52 2141 .6.....Z..RIA
00C1E0 7A22 297C C931 FA41 218B 6F22 297C CDE9 ..")..1.A!..")...
00C1F0 6BED 5B43 7CFD CB34 C6D5 CD24 6ECD 846E ...C...4...$.

```

Fig. 2

```

00C100 CD24 6ED1 CDF4 52C3 706E 0000 0000 0000 .$.R.....
00C110 0000 3AB9 7CB7 2801 05C9 EB09 79B7 C825 .....(.....%
00C120 C9FE 8CCA 8371 FE8D C289 71C3 8371 2812 .....(.....(
00C130 FE0D 280E FE0A 280A 083E 2032 E837 08C3 ..((...>.2.7..
00C140 745F 32E8 37C3 745F 3B01 B1A5 7ADD E5FD ..2.7...;R..$.
00C150 E5E5 C5D5 F53E 4332 E23F 3E44 32E5 3F3E ..>C2.?>D2.?>
00C160 4E32 E83F CD2B 00B7 28FA FE43 280A FE44 N2.?.+..(C(..D
00C170 280D FE4E 2813 18EC 0E0F CD8D 0518 0A9E (.N(.....
00C180 1BCD 8D05 0E47 CD8D 05F1 D1C1 E1FD E1DD .....G.....
00C190 E1CD C970 C364 7000 0000 0000 0000 0000 .....
00C1A0 0000 0000 0000 0000 0000 0000 0000 0000 .....
00C1B0 0000 0000 0000 0000 0000 0000 0000 0000 .....
00C1C0 0000 0000 0000 0000 0000 0000 0000 0000 .....
00C1D0 0000 0000 0000 0000 0000 0000 0000 0000 .....
00C1E0 0000 0000 0000 0000 0000 0000 0000 0000 .....
00C1F0 0000 0000 0000 0000 0000 0000 0202 0052 .....R

```

Fig. 3

!!!INTRODUCING!!!

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A Real World Interface
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ATHANA quality 5¼ floppy disk-
ettes **with hubrings in plastic**
library case

(soft, 10, 16 sector)
10/34.25
100/321.85

BOOKS

6809 assembly language prog. \$16.99
Learning Level II \$15.95
The Basic Handbook \$19.95
Microsoft Basic decoded &
other mysteries \$29.95
TRS-80 disk &
other mysteries \$22.50

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pany checks require two to
three weeks to clear. Add \$2.
for shipping charges.



*"If you ever change printers,
hang on to this article..."*

save this sector to disk. Make sure you dou-
ble check everything before you save it,
though.

Check the operation of Scripsit/LC with
the new modification. After loading Scrip-
sit/LC, either load text that you have already
written or write something into the text buf-
fer. Hit Break, then P for print. The message
"Testing for Errors" will appear and then
clear from the screen. Your prompts will
now display. Select one of the letters and
press the corresponding key. Your text
should start printing immediately in the
form you have programmed. Check each of
the special commands if you have more
than one. Do not forget to turn off the
printer to cancel your last command before
you check the next one.

Scripsit/UC modifications will be easy
since the work in the lowercase version is
already complete. All that is necessary is to
copy the lowercase sectors to the appropri-
ate uppercase sectors. If you are using
Superzap, copy track 0BH, sector 0, to track
0CH, sector 5 and track 0CH, sector 1, to

track 0DH, sector 6. If you are using RSM-2D,
load sector 110 and save it on sector 125.
Also load sector 121 to save on sector 136.

It would be a good idea to check track
0CH sector 5 with Fig. 1 and track 0DH sec-
tor 6 with Fig. 2 before you make any modi-
fications to make sure they are the correct
sectors.

Some Final Thoughts

Depending on how your printer handles
its programming commands, it may be pos-
sible to obtain some additional commands
without having to include them in the patch.
For instance, if I send the Compress com-
mand and hit the Clear to escape the print
routine, I can again enter the print routine
and respond with the Darken Print mode. If
you want to switch printing modes, you will
have to turn the printer off and then back on
to cancel the last command.

One final word: If you ever change print-
ers, hang on to this article so you will be
able to modify Scripsit to accommodate
your new printer. ■

```

7AA5 DD E5 PUSH IX ;
7AA7 FD E5 PUSH IY ;
7AA9 E5 PUSH HL ; SAVE ALL OF THE
7AAA C5 PUSH BC ; REGISTERS.
7AAB D5 PUSH DE ;
7AAC F5 PUSH AF ;

7AAD 3E 43 LD A,43 ;
7AAF 32 E2 3F LD (3FE2),A ; DISPLAY THE LETTERS
7AB2 3E 44 LD A,44 ; C, D, AND N ON THE
7AB4 32 E5 3F LD (3FE5),A ; VIDEO MONITOR.
7AB7 3E 4E LD A,4E ;
7AB9 32 E8 3F LD (3FE8),A ;

7ABC CD 2B 00 CALL 002B ; SCAN THE KEYBOARD
7ABF B7 OR A ; FOR AN INPUT
7AC0 28 FA JR Z,7ABC ;

7AC6 FE 43 CP 43 ; IS IT A "C"?
7AC8 28 0A JR Z,7AD0 ; IF YES, JUMP FWD 11
7ACA FE 44 CP 44 ; IS IT A "D"?
7AC8 28 0D JR Z,7AD7 ; IF YES, JUMP FWD 14
7ACA FE 4E CP 4E ; IS IT AN "N"?
7ACC 28 13 JR Z,7AE1 ; IF YES, JUMP FWD 20
7ACE 18 EC JR 7ABC ; GO BACK TO KEYBD

7AD0 0E 0F LD C,0F ; COMPRESSED PRINT
7AD2 CD 8D 05 CALL 058D ; SEND "0F" TO PRINTER
7AD5 18 0A JR 7AE1 ; JUMP AHEAD 11
7AD7 0E 1B LD C,1B ; DARKEN PRINT, SEND
7AD9 CD 8D 05 CALL 058D ; "1B" AND "47" TO
7ADC 0E 47 LD C,47 ; THE PRINTER
7ADE CD 8D 05 CALL 058D ;

7AE1 F1 POP AF ;
7AE2 D1 POP DE ;
7AE3 C1 POP BC ; RESTORE ALL THE
7AE4 E1 POP HL ; REGISTERS
7AE5 FD E1 POP IY ;
7AE7 DD E1 POP IX ;

7AE9 CD C9 70 CALL 70C9 ; A SCRIPSIT ROUTINE
7AEC C3 64 70 JP 7064 ; JMP BACK TO SCRIPSIT
    
```

Program Listing



Invasion Orion: Can You Defeat The Klaatu and Your Computer?

Look your computer straight in the eye, load in the new **Invasion Orion** and suddenly you are the Fleet Admiral, the Commander-in-Chief. And only you can stop the alien forces: the robotic Klaatu who have just invaded your Stellar Union space.

You command as many as nine starships; each ship spends energy on moving, on shielding itself, on firing its three weapon systems—destructor beams, missiles, torpedoes. There are 30 different types of starships—all armed with such a fantastic array as to intimidate the Klaatu.

But it isn't as easy as it seems. Your ships have only a limited amount of energy and you must decide how to allocate that energy to destroy the enemy.

Will your ship's armor be enough to stop the enemy's torpedo? Or should you divert energy from your beam to your shield? Move in for the kill on your weakened opponent and risk a beam attack? Or outrun the enemy? With each turn you take, your energy is replenished. Can you defeat the Klaatu? Or is your computer smarter than you are?

Invasion Orion is an EPYX game. Like all EPYX games, you will never get bored playing. Not in your or your computer's lifetime. Every game is different and fresh. Choose from three levels of skill: beginner, intermediate, expert. Ten fully tested scenarios, from one-on-one starship combat to full scale battle. Two programs: the first uses your pre-created scenarios to play the game; the second lets you create your own scenarios and design your own ships. A game that is infinitely expandable.

Yet so very easy to learn. With any of the ten scenarios, the computer takes care of all the details; no complex rules to

remember. The screen shows prompts for your battle orders. Just concentrate on your strategy for victory. Complete with superb graphics (if you have either an Apple or an Atari, you can enjoy color and sound!) and with battle manual, game program, scenario creation program, data files for your computer.

Invasion Orion. Another bug-free, easy-loading lifetime computer game from EPYX. With the unique EPYX life-time warranty: If anything happens to your cassette or disk at any time and for any reason, send it back with just \$5.00 for shipping and handling and we will send you a brand new one.

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See if you can follow the plot of this article.

The Ups and Downs of Graphs

Richard Foley
14629 N. 61st Drive
Phoenix, AZ 85306

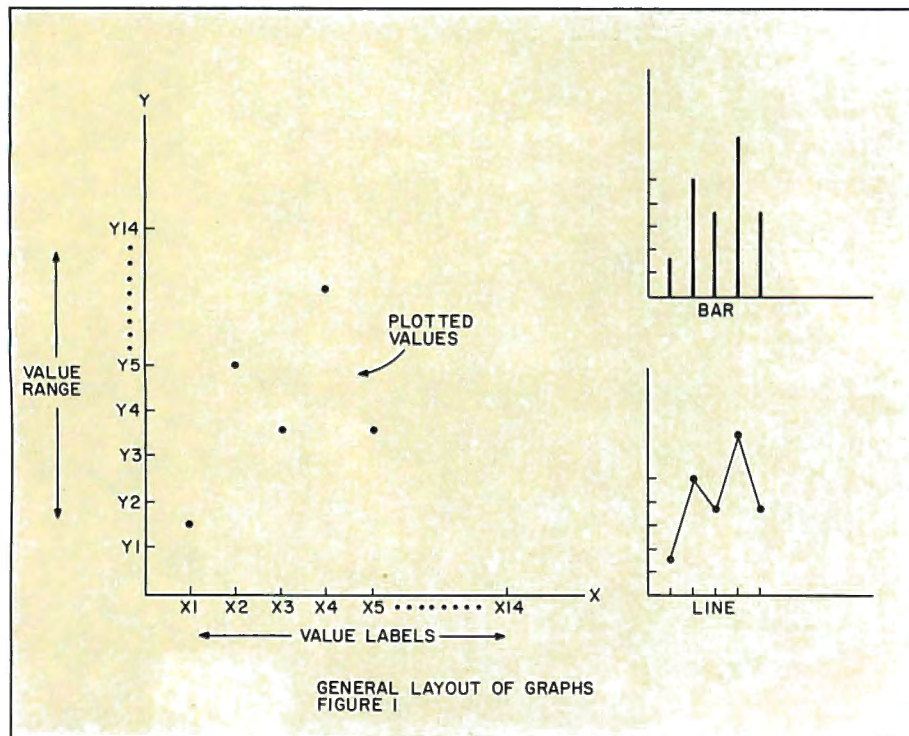
Line and bar graphs are, in most cases, the best method of interpreting statistical or numerical data. With just one glance at a graph you get an overall picture of the

data presented and can easily spot dips, peaks and trends. In the business world graphs are used in such areas as sales, profits, earnings, production and others. On a graph you can see an upward trend in sales or a downward trend in earnings, instead of deducing it from a list of figures.

At home, graphs can also be used in many areas. People interested in the weather can graph high and low temperatures, rainfall and barometric pressure. Those on a diet can watch the up and down

trends of their weight. Monthly utility bills, miles jogged, and a child's growth are a few of the many other applications that generate informative graphs.

However, actually sitting down with graph paper, rulers, pencils, and so forth to draw a graph is not a task many of us like to undertake. The TRS-80, with its built-in graphics and Level II Basic, is ideally suited to computerize graph building and storing. The program described in this article makes it possible to build and maintain line and bar graphs using the TRS-80.



Graph Description

The general layout of the graphs this program generates is shown in Fig. 1. It is a standard X, Y graph with the value range running up the Y axis, and the value labels along the X axis. The actual values are plotted as points in the area defined by the X and Y axis. There is room for 14 values to be plotted along the X axis and for 14 values of the value range to be displayed on the Y axis. The actual number of Y values that can be plotted is 40. The plotted points either can be connected together by a line, or connected to the X axis by bars. Photos 1 and 2 show how these graphs appear on the TRS-80's screen. The program can store and retrieve up to 50 different graphs in memory.

Program Functions

The four major functions the program performs are:

- Read Data Tape—previously saved graphs are read from tape and loaded into memory.
- Build a New Graph—the program asks for the information needed to plot a new graph, and draws it on the screen.

"With just one glance at a graph you get an overall picture of the data presented..."

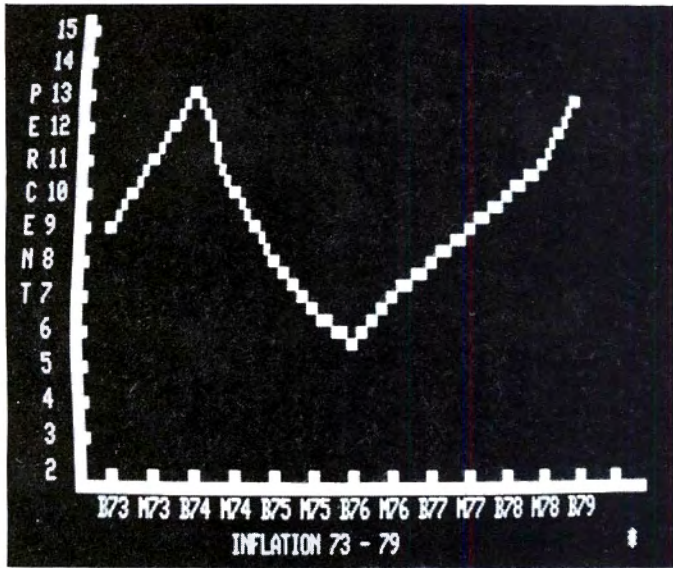


Photo 1

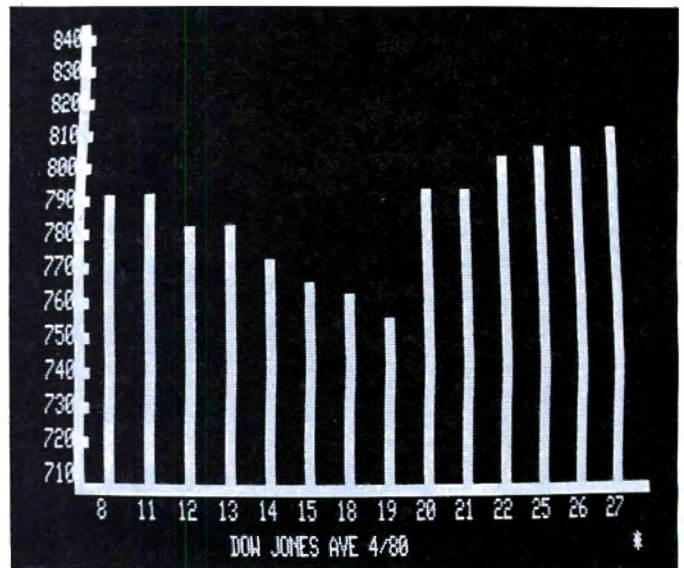


Photo 2

- Retrieve a Graph—a list of all the graphs in memory is displayed and a selection is asked for; the selected graph is retrieved and drawn on the screen.

- Write Data Tape—all graphs in memory are written to tape. The above functions are selected from the menu screen by pressing the corresponding numeric key.

Once a graph is fully displayed on the screen, either a new graph or one retrieved from memory, there are six additional functions available:

- Return to Menu—the screen is cleared and the menu screen is displayed; if the displayed graph had not been previously saved it will be lost.

- Save Graph—if the graph is new the program asks for a one-to-eight character name and inserts the graph data sequentially into memory; if the graph is old it is replaced in memory.

- Switch Type—if the graph is a line graph it will be redrawn as a bar graph and vice versa.

- Add a Value—the label and value for the next open spot on the X axis are asked for and then plotted.

- Change a Value—the program asks for the label of the value to be changed and then asks for the new value; the graph is redrawn with the new value.

- Delete—if the graph is in memory, it is deleted.

All of the above functions are selected by pressing the corresponding numeric key, when the asterisk is displayed in the bottom right corner of the graph screen.

Drawing a Graph

The primary function of the program is, of

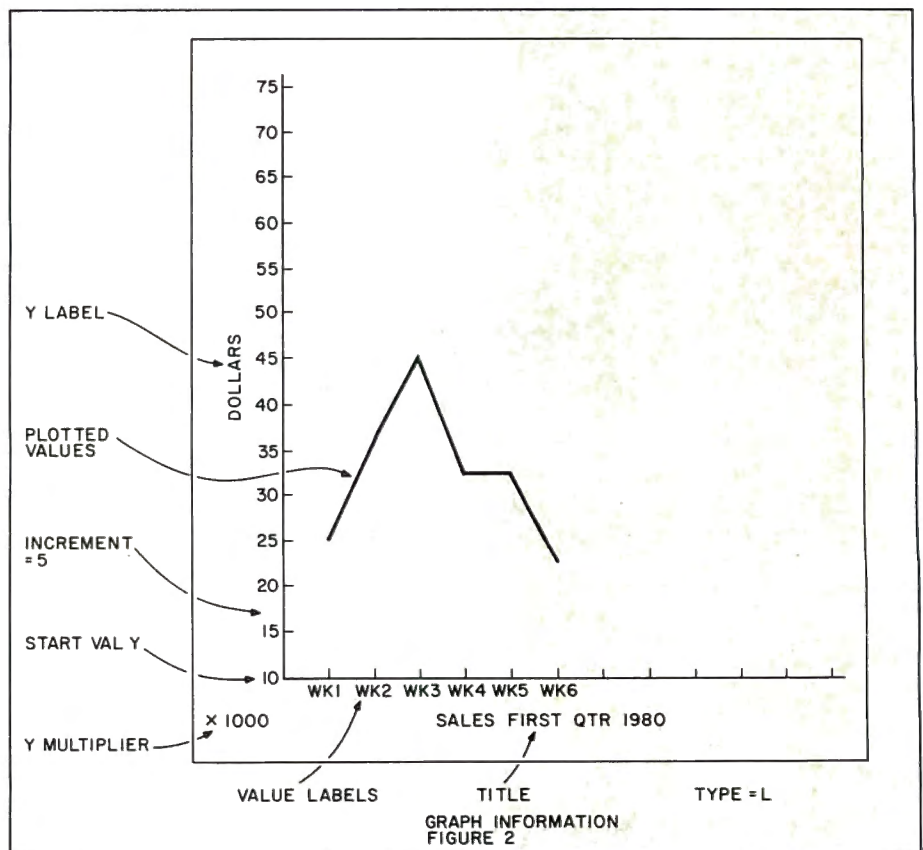
course, to draw graphs. After pressing key two from the menu screen, the program asks for the following information to label and plot a graph (Fig. 2 shows how this information is used in the graph):

- Start Value Y—this is the integer value with which the Y axis starts. It can range

from minus-999 to approximately plus-950.

- Increment Y (1-99)—this is the integer value by which the Y value will be incremented, going up the Y axis.

- Label Y (one-eight characters)—this is the name of what the values represent,





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- Satisfy your boss, wife, (husband?), or yourself that you know how wisely (or foolishly) money is being spent.

Exceedingly simple to use (we tested it on simple people!), now there is no excuse not to know where the hell you lost all that money, whether it was last year or last month. Best of all, maybe now you'll be able to save some of that dough for the future! Requires 32K and one or more disk drives. Specify Model I or III. At only \$39.95 postpaid, it's a steal sure to save you money!

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**"A
PERFECT
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EVERY
TIME"**



ALPHANETICS TRS-80 TAPE DIGITIZER

* From a review in the September-October 1980 Elementary Electronics. Reprints available upon request.

At last there is a cure for TRS-80 tape loading blues. For over three years, Alphanetics has been selling the TRS-80 Tape Digitizer, a proven hardware solution for your software problems. No longer need you juggle the recorder's volume control endlessly, trying for a perfect load of a pre-recorded program. Just pop the tape into the cassette recorder, process the signal through our digitizer, and you're ready to RUN a perfect load!

Just check out the Tape Digitizer's features...

- Makes tape program loading virtually independent of volume control setting.
- Allows copying system and normal tapes without using computer.
- Makes a perfect digital copy of any tape, without using computer, removing hum, noise, and cures minor dropouts.
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- A.C. powered — no batteries to replace.
- Housed in a sturdy, attractive metal case.
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Feed your cassette to the Alphanetics Tape Digitizer and feed your computer the exact digital waveform the TRS-80 gave your tape. Get rid of your tape bugs today — \$64.95 postpaid or return within 10 days for a full refund!

Program Listing

```

10 REM *** SET UP ***
15 CLEAR6750:DEFINTC,V,Y:DEFSTRIS,M,L,P,T,N,B:DEFSENGF,D:DIMM(50
) ,LV(14),Y(14):BL=STRING$(55," ")
50 REM *** TITLE PAGE ***
55 CLS:PRINTCHR$(23):PRINT:PRINT:PRINT" *** GRAPH-IT ***":
PRINT:PRINT:PRINT:PRINT:PRINT:PRINT" BY RICHARD POLE
Y":PRINT" 11 PERKINS AVE.":PRINT" WILMINGTON D
E 19809":FORCT=1TO3000:NEXT
100 REM *** MENU ***
150 CLS:PRINT@88,"*** GRAPH-IT ***";PRINT@210,"PRESS NUMBER TO
SELECT -";PRINT@345,"1 - LOAD DATA TAPE";PRINT@409,"2 - BUILD
NEW GRAPH";PRINT@473,"3 - RETRIEVE GRAPH";PRINT@537,"4 - WRITE
DATA TAPE";PRINT@601,"5 - END";
200 I=INKEY$:IFI=" "THEN200
250 IFI>"5"OR<"1"THEN200ELSEC=VAL(I)
300 IFC=5THEN450
350 ONCGOSUB1000,1400,2500,4000
400 GOTO150
450 IFSW<>"1"THEN650
475 IFCM=8THEN650
500 PRINT@717,"GRAPHS IN MEMORY HAVE BEEN UPDATED.":PRINT@777,"
DO YOU WANT TO SAVE MEMORY ON TAPE (Y OR N)?";
510 I=INKEY$:IFI=" "THEN510
515 IFI="N"THEN650
550 IFI="Y"THENGOSUB4000:GOTO150
600 GOTO510
650 END
1000 REM *** LOAD DATA TAPE ***
1050 CLS:PRINT@213,"1. MOUNT TAPE";PRINT@341,"2. SET TO PLAY";:
PRINT@469,"3. PRESS ENTER WHEN READY";:CI=495:GOSUB14000
1100 PRINT@602,"* LOADING *";INPUT#-1,C:CM=C:CT=0
1150 INPUT#-1,I:CT=CT+1:M(CT)=LEFT$(I,122):IFCT=CMTHEN1250
1200 CT=CT+1:M(CT)=MID$(I,123,122):IFCT<>CMTHEN1150
1250 PRINT@602,"* DONE *";PRINT@725,"PRESS ENTER TO CONTINUE
...";:CI=752:GOSUB14000:RETURN
1400 REM *** BUILD NEW GRAPH ***
1450 GOSUB7000
1500 PRINT@968,BL;:PRINT@968,"START VALUE Y =";:CI=983:GOSUB1400
0:VY=INT(VAL(I))
1510 IFVY<-999THENPRINT@968,BL;:PRINT@968,"Y MUST BE GREATER THA
N -999, REENTER!";:FORCT=1TO1500:NEXT:GOTO1500
1550 PRINT@968,BL;:PRINT@968,"INCREMENT (1-99) =";:CI=986:GOSUB1
4000:C=INT(VAL(I)):IFC<1ORC>99THEN1550
1600 CN=C:IF(CN*13)+VY>999THENPRINT@968,BL;:PRINT@968,"Y OR IN
C TOO LARGE, REENTER!";:FORCT=1TO1500:NEXT:GOTO1500
1650 PRINT@968,BL;:PRINT@968,"LABEL Y (1-8 CHR) >";:CI=987:GOSUB
14000:IFLEN(I)>8THEN1650
1700 IFLEN(I)<8THENI=I+STRING$(8-LEN(I)," ")
1750 LY=I
1800 PRINT@968,BL;:PRINT@968,"Y MULTIPLIER (1-5 CHR) OR -NONE ->
";:CI=1002:GOSUB14000:IFLEN(I)>5THEN1800
1850 IFLEN(I)<5THENI=I+STRING$(5-LEN(I)," ")
1900 MY=I:GOSUB10500:PW="0":CT=1
2000 GOSUB11300:IFPW="1"THEN2100
2050 CT=CT+1:IFCT<15THEN2000
2100 PRINT@968,BL;:PRINT@968,"TITLE (1-24 CHR) >";:CI=986:GOSUB1
4000:IFLEN(I)>24THEN2100
2150 IFLEN(I)<24THENI=I+STRING$(24-LEN(I)," ")
2200 TI=I
2250 PRINT@968,BL;:PRINT@968,"TYPE (L OR B) >";:CI=983:GOSUB1400
0:IFI<>"L"ANDI<>"B"THEN2250
2300 TY=I:IFTY="L"THENGOSUB5000ELSEGOSUB11000
2350 NS="1":GOSUB7500
2400 RETURN
2500 REM *** RETRIEVE GRAPH ***
2510 IFCM=8GOSUB13000:GOTO3500
2550 CLS:PRINT@17,"****";CM;" GRAPHS IN MEMORY ****";:CP=66:C2=1:C
T=0
2600 PRINT@CP,LEFT$(M(C2),8):C2=C2+1:IFC2>CMTHEN2650
2625 CP=CP+10:CT=CT+1:IFCT=6CP=CP+4:CT=0
2630 GOTO2600
2650 PRINT@982,"ENTER CHOICE >";:CI=996:GOSUB14000
2700 IFLEN(I)>8THENI=LEFT$(I,8)
2750 IFLEN(I)<8THENI=I+STRING$(8-LEN(I)," ")
2800 NA=I:D=INT(.5*CM):D1=1:D2=CM
2850 IF(D2-D1)<3THEN3100
2900 IFNA<LEFT$(M(D),8)THEN3050
3000 D1=D:D=INT(.5*(D2-D))+D:GOTO2850
3050 D2=D:D=INT(.5*(D-D1))+D1:GOTO2850
3100 CL=0:CT=D1
3110 IFNA<LEFT$(M(CT),8)CL=CT:GOTO3200
3125 CT=CT+1:IFCT>D2THEN3150ELSE3110
3150 PRINT@968,"NOT FOUND, ENTER CHOICE OR SPACE TO EXIT >";:CI=
1009:GOSUB14000:IFI=" "THEN3500ELSEPRINT@968,BL;:GOTO2700
3200 NG=MID$(M(CL),9,1):VY=VAL(MID$(M(CL),10,3)):CN=VAL(MID$(M(C
L),13,2)):LY=MID$(M(CL),15,8):MY=MID$(M(CL),23,5):CP=28:IFNG="
VY=VY-1
3250 FORCT=1TO14:LV(CT)=MID$(M(CL),CP,3):Y(CT)=VAL(MID$(M(CL),CP
+3,2)):CP=CP+5:NEXT
3300 TI=MID$(M(CL),98,24):TY=RIGHT$(M(CL),1)
3350 GOSUB7000:GOSUB10500:FORCT=1TO14:GOSUB10700:NEXT
3400 IFTY="L"THENGOSUB5000ELSEGOSUB11000
3450 NS="0":GOSUB7500
3500 RETURN
4000 REM *** WRITE DATA TAPE ***
4010 IFCM=8GOSUB13000:GOTO4400
4050 CLS:PRINT@213,"1. MOUNT TAPE";:PRINT@341,"2. SET TO RECORD"
;:PRINT@469,"3. PRESS ENTER WHEN READY";:CI=495:GOSUB14000
4100 PRINT@602,"* WRITING *";PRINT#-1,CM:CT=0
4150 CT=CT+1:I=M(CT):IFCT=CMTHEN4250
4200 CT=CT+1:I=I+M(CT)
4250 PRINT#-1,I
4300 IFCM<>CMTHEN4150
4350 SW="0":PRINT@602,"* DONE *";:PRINT@725,"PRESS ENTER TO C
ONTINUE...";:CI=752:GOSUB14000
4400 RETURN
5000 REM *** DRAW LINE BETWEEN POINTS ***
5010 YI=1:IFLV(YI+1)=" "THEN6400
5015 CX=9+(YI*8):CY=Y(YI)
5020 IFY(YI)>Y(YI+1)DI=-1
5050 IFY(YI)<Y(YI+1)DI=1
5100 IFY(YI)=Y(YI+1)DI=0:GOTO5300
5150 DF=(Y(YI)-Y(YI+1)):DF=ABS(DF)-1

```

Program continues

Program continued

```
5200 IPDF=1CY=CY+DI:DI=0:GOTO5300
5225 IPDF=0GOSUB6500:CY=CY+DI:GOSUB6500:GOTO6300
5250 IPDF>6THEN5600
5275 IPDF<6THEN5350
5300 FORCT=1TO6:CX=CX+1:CY=CY+DI:SET(CX,CY):NEXT:GOTO6300
5350 IPDF=2CY=CY+DI:GOSUB6500:CY=CY+DI:GOSUB6500:GOTO6300
5400 D2=6-DF:D3=DF-D2:D4=D3:IPD3<1THEN5500
5450 GOSUB6600:D3=D3-1:IPD3>(.5*D4)THEN5450
5500 FORCT=1TOD2:GOSUB6600:CX=CX+1:SET(CX,CY):NEXT
5550 IPD3=0THEN6300
5570 GOSUB6600:D3=D3-1:GOTO5550
5600 D2=DF/6:D2=CINT(D2):D3=6*D2:D3=DF-D3:D4=D2:D2=D2+1:D5=6-D3:
D6=D5:IPD5=0THEN5900
5700 CX=CX+1
5750 FORCT=1TOD4:CY=CY+DI:SET(CX,CY):NEXT
5800 D5=D5-1:IPD5>(.5*D6)THEN5700
5850 IPD3=0THEN6050
5900 CX=CX+1
5950 FORCT=1TOD2:CY=CY+DI:SET(CX,CY):NEXT
6000 D3=D3-1:IPD3<0THEN6050
6010 IPD3=0THEN6050ELSE5900
6050 CT=0:IPD5=0THEN6300
6100 CX=CX+1
6150 CY=CY+DI:SET(CX,CY):CT=CT+1:IPCT=D4THEN6200ELSE6150
6200 D5=D5-1:GOTO6050
6300 YI=YI+1:IFYI=14THEN6400
6350 IFLV(YI+1)=- "THEN6400ELSE5015
6400 RETURN
6500 FORCT=1TO3:CX=CX+1:SET(CX,CY):NEXT:RETURN
6600 CX=CX+1:CY=CY+DI:SET(CX,CY):RETURN
7000 REM *** LAYOUT X AND Y AXIS ***
7020 CLS:FORCY=0TO41:SET(10,CY):SET(11,CY):NEXT
7050 CY=41:FORCX=12TO127:SET(CX,CY):NEXT
7100 CX=12:FORCY=1TO37STEP3:SET(CX,CY):NEXT
7150 CY=40:FORCX=16TO120STEP8:SET(CX,CY):SET(CX+1,CY):NEXT
7200 RETURN
7500 REM *** GRAPH FUNCTIONS ***
7550 PRINT@968,BL;:PRINT@980,TI;:PRINT@1022,"*";
7600 I=INKEYS:IFI<"1"ORI>"6"THEN7600
7625 IFI="1"THEN7675
7650 PRINT@1022," ";:C=VAL(I):ONGOSUB,7700,8700,9100,9500,10000

7655 GOTO7500
7675 RETURN
7700 REM *** SAVE ***
7725 SW="1"
7750 IFNS="0"THEN7925
7760 IFCM=50PRINT@968,BL;:PRINT@968,"MEMORY FULL, CANNOT ADD!";:
FORCT=1TO2000:NEXT:GOTO7550
7800 PRINT@968,BL;:PRINT@968,"ENTER NAME (1-8 CHR) >";:CI=990:GO
SUB14000:IFLEN(I)>8THEN7800
7850 IFLEN(I)<8THENI=I+STRING$(8-LEN(I)," ")
7900 NA=I
7925 I=NA:I3=" ":IPVY<0THENNG="":VY=VY*-1ELSENG=" "
7950 I=I+NG:C1=VY:C3=3:GOSUB8550:C1=CN:C3=2:GOSUB8550:I=I+LY:I=I
+MY:CT=1:C3=2
8000 IFLV(CT)=- "I=I+" 00":GOTO8100
8050 I=I+LV(CT):C1=Y(CT):GOSUB8550
8100 CT=CT+1:IFCT<15THEN8000
8150 I=I+T:I=I+TY:IFNS="0"*(CL)=I:GOTO8400
8175 IFCM=0CL=1:M(CL)=I:CT=0:GOTO8350
8200 CT=CM
8210 IFNA=LEFT$(M(CT),8)PRINT@968,BL;:PRINT@968,"NAME ALREADY IN
MEMORY, REENTER!";:CT=CT+2:IFCT<MTHENFORCL=CTTOCM:M(CL)=M(CL+1
):NEXT:FORCL=1TO1500:NEXT:GOTO7800ELSEFORCL=1TO1500:NEXT:GOTO7800
8250 IFNA>LEFT$(M(CT),8)THENM(CT+1)=I:GOTO8350
8300 M(CT+1)=M(CT):CT=CT-1:IFCT=0THENM(1)=I:GOTO8350ELSE8210
8350 CM=CM+1
8400 PRINT@968,BL;:PRINT@968,"* SAVED *";:FORCL=1TO1500:NEXT
8450 IFNS="1"NS="0":CL=CT+1
8500 RETURN
8550 REM *** ENCODE NUMERIC ***
8575 I2=STR$(C1):IFLEN(I2)>3THENI2=RIGHT$(I2,C3):GOTO8650
8600 IFLEN(I2)=C3THEN8650ELSEI2=I2+I2:GOTO8600
8650 I=I+I2:RETURN
8700 REM *** SWITCH ***
8750 GOSUB8900:IFTY="B"THENY="L"ELSEY="B"
8800 IFTY="L"THENGOSUB5000ELSEGOSUB11000
8850 RETURN
8900 REM *** CLEAR GRAPH AREA ***
8925 B2=STRING$(56," ") :FORCT=7TO75STEP64:PRINT@CT,B2;:NEXT
8950 FORCX=16TO125:RESET(CX,39):RESET(CX,40):NEXT:CY=40:FORCX=16
TO120STEP8:SET(CX,CY):SET(CX+1,CY):NEXT:CT=1
9000 GOSUB10700:CT=CT+1:IFCT>14THEN9050
9025 IFLV(CT)<>"THEN9000
9050 RETURN
9100 REM *** ADD VALUE ***
9150 IFLV(14)<>"PRINT@968,BL;:PRINT@968,"NO ROOM LEFT TO ADD
":FORCT=1TO1500:NEXT:GOTO9400
9200 CT=0
9250 CT=CT+1:IFLV(CT)<>"THEN9250
9300 PW=" ":GOSUB11300:IFPW="1"THEN9400
9350 IFTY="L"THENGOSUB5000ELSEGOSUB11000
9400 RETURN
9500 REM *** CHANGE VALUE ***
9550 PRINT@968,BL;:PRINT@968,"ENTER NAME OF VAL >";:CI=988:GOSUB
14000:CT=0
9560 IFLEN(I)>3THENI=LEFT$(I,3)
9565 IFLEN(I)<3THENI=I+STRING$(3-LEN(I)," ")
9600 CT=CT+1:IFCT>14THEN9900
9650 IFLV(CT)<>ITHEN9600
9700 PRINT@968,BL;:PRINT@968,"NEW VALUE =";:CI=980:GOSUB14000:F=
VAL(I)
9750 IFF<VYORF>((CN*13)+VY)THENPRINT@968,BL;:PRINT@968,"VAL OUT
OF RANGE, REENTER!";:FORCL=1TO1500:NEXT:GOTO9700
9800 GOSUB12000:GOSUB8900:IFTY="L"THENGOSUB5000ELSEGOSUB11000
9850 RETURN
9900 PRINT@968,BL;:PRINT@968,"NAME NOT FOUND, REENTER!";:FORCT=1
TO1500:NEXT:GOTO9550
10000 REM *** DELETE ***
10050 IFNS="1"PRINT@968,BL;:PRINT@968,"UNABLE TO DELETE, NOT SAV
ED";:FORCT=1TO1500:NEXT:GOTO10300
10100 IFCL=CMGOTO10200
10150 M(CL)=M(CL+1):CL=CL+1:IFCL<CMTHEN10150
```

Program continues

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"After you enter each value, its point is plotted on the screen."

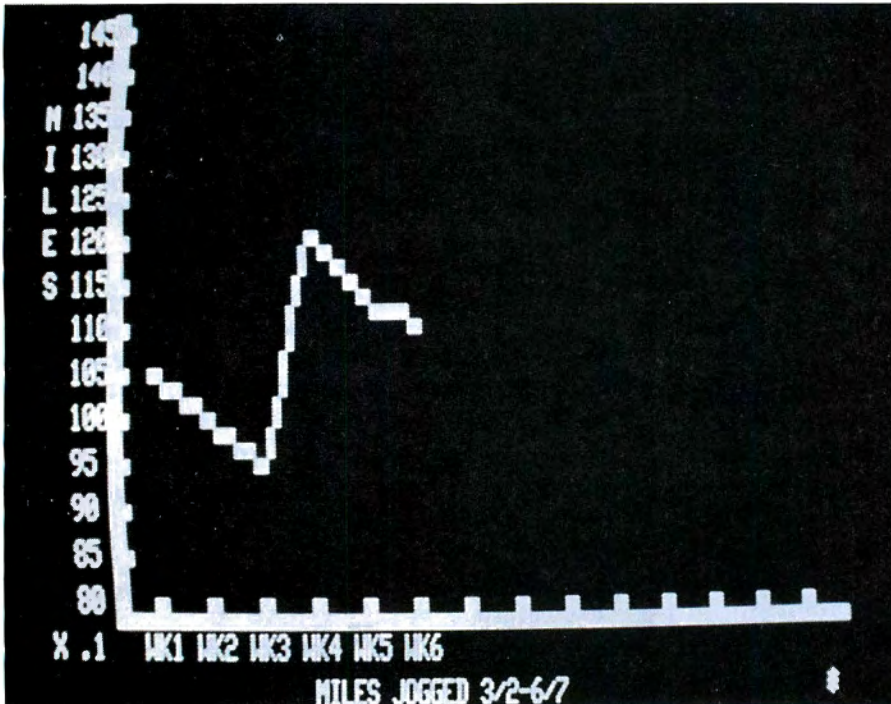


Photo 3

enter .1. This shows that the values represent 8.0 to 14.5 miles. All the Y axis information would then be displayed on the screen and the first value label would be asked for.

You could then enter labels and values such as WK1 and 106 (for 10.6 miles). If you had been jogging for six weeks you would enter six labels and values and when asked for the seventh label, you would enter a space to stop entering values. After you enter each value, its point is plotted on the screen. You would then enter a title such as Miles Jogged 3/2-6/7.

Finally you enter L for line graph and the line is drawn on the screen. You could then save the graph and write it to tape with the rest of the graphs in memory. At a later date, you could load the tape, retrieve the graph and add values to it. Photo 3 shows the graph our running example would generate.

Program Description

The program is written in Level II Basic for 16K memory. It takes 9K to load and run, leaving 7K to store up to 50 graphs. It is written in a structured or modular manner, meaning that each routine or module is a

such as dollars, pounds, temperature, miles, and so forth.

- Y Multiplier (one-five characters)—this is what the Y values are to be multiplied by to handle decimal numbers and large and small Y values. Examples are .1, .001, 1000, 100, MIL and so on. If no multiplier is needed, NONE is entered.

- Label Value *n* (one-three characters)—*n* = 1 to 14; this is the name of the value you are going to enter, such as WK1, Sun, May, USA, Bob and so on. A space is entered to stop inputting values.

- Value *n* - *n* = 1 to 14—this is the actual value to be plotted; it has to be within the range displayed on the Y axis, but it does not have to be an integer.

- Title (one-24 characters)—this is the title of the graph.

- Type (L or B)—L to select a line graph or B to select a bar graph.

For example, if you wanted to graph how many miles you jog each week, you could proceed as follows: When the menu screen is displayed, you press two. The X and Y axes are drawn and the program asks for the start Y value. We'll assume you jog between eight and 15 miles a week. You know you can display 14 numbers on the Y axis, so this means you can display every mile and half-mile between eight and 14.5. Only integers are allowed on the Y axis so you enter 80. The program then asks for the increment and you enter five. For the Y label you enter Miles and then for the Y multiplier you

Program continued

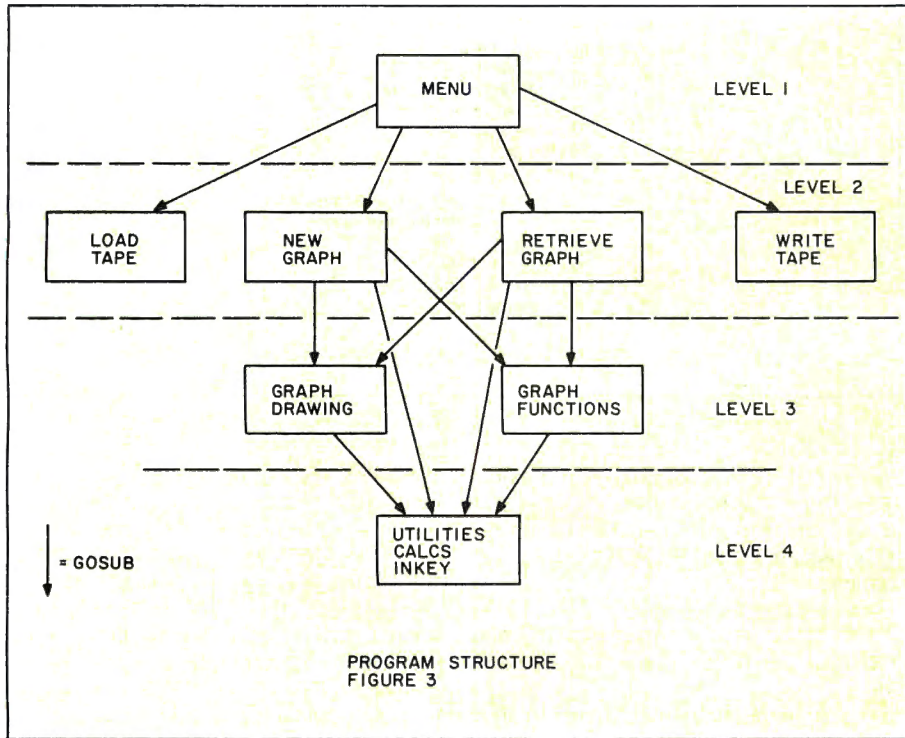
```

10200 CM=CM-1:SW="1"
10250 PRINT@968,BL;:PRINT@968,"* DELETED *";:FORCT=1TO1500:NEXT
10300 RETURN
10500 REM *** Y AXIS ***
10550 CI=VY:FORCT=833TO1STEP-64:PRINT@CT,STR$(CI);:CI=CI+CN:NEXT

10600 FORCT=1TO8:PRINT@(64+(CT*64)),MID$(LY,CT,1);:NEXT
10630 IFMY="NONE" THEN10670
10650 PRINT@896,"X";:PRINT@897,MY;
10670 RETURN
10700 REM *** LABEL & PLOT VALUE ***
10725 IFLV(CT)=" " THEN10850
10750 PRINT@(899+(CT*4)),LV(CT);
10800 SET((8+(CT*8)),Y(CT)):SET((9+(CT*8)),Y(CT))
10850 RETURN
11000 REM *** BAR GRAPH ***
11025 CT=1
11050 FORCY=40TOY(CT)STEP-1:SET((8+(CT*8)),CY):SET((9+(CT*8)),CY);:NEXT
11100 CT=CT+1:IFCT>14THEN11200
11150 IFLV(CT)<>" " THEN11050
11200 RETURN
11300 REM *** ASSIGN AND LABEL VALUE ***
11550 PRINT@(899+(CT*4)),CT;:PRINT@968,BL;:PRINT@968,"LABEL VALU
E";CT; {3 CHR} OR SPACE TO EXIT >;:CI=1009:GOSUB14000:IFI=" "T
HENPW="1":PRINT@(899+(CT*4)), " ";:FORCI=CTTO14:LV(CI)=" " :NE
XT:GOTO11900
11600 IFLN(I)>3THEN11550
11650 IFLN(I)<3THENI=1+STRING$(3-LEN(I)," ")
11700 LV(CT)=I
11750 PRINT@968,BL;:PRINT@968,"VALUE";CT;"=";:CI=977:GOSUB14000:
F=VAL(I)
11800 IFF<VYORP>((CN*13)+VY) THENPRINT@968,BL;:PRINT@968,"VAL OUT
OF RANGE, REENTER!";:FORCI=1TO1500:NEXT:GOTO11750
11850 GOSUB12000:GOSUB10700
11900 RETURN
12000 REM *** Y CALC ***
12050 IFCN>2F=INT(F)
12100 F3=F-FIX(F):DF=INT(F-VY):F2=DF/CN:D4=INT(F2*3):IFF3=0THEN1
2200
12150 IFF3<.5THEND4=D4+1ELSED4=D4+2
12200 Y(CT)=40-D4:RETURN
13000 CLS:PRINT@78,"NO GRAPHS IN MEMORY!";:PRINT@142,"PRESS ENTE
R TO RETURN TO MENU -";:CI=175:GOSUB14000:RETURN
14000 REM *** INKEY ROUTINE ***
14010 I2=""
14020 I=INKEY$:IFI=""THEN14020
14030 IFASC(I)=8THEN14110
14060 IFASC(I)=13THEN14150
14100 CI=CI+1:PRINT@CI,I;:I2=I2+I:GOTO14020
14110 IFLN(I2)=0THEN14020ELSEPRINT@CI," ";:CI=CI-1:I2=LEFT$(I2,
(LEN(I2)-1)):GOTO14020
14150 I=I2:RETURN

```

"Each graph is stored in memory and on tape as one 122-character string."



GOSUB from a higher level. The top level, the menu, is the only routine that is not a GOSUB. Fig. 3 shows how the levels are arranged in the program. For example, the calculated Y coordinate routine (level 4) is a GOSUB from the assign value routine (level 3), which is a GOSUB from the new graph routine (level 2) that is a GOSUB from the menu routine (level 1).

All of the routines in the program are independent modules. A GOSUB is the only way into the module and the Return statement is the only way out. All GOTOs in a module are to statements within that module or to the Return statement. The variables used by the program are listed in Fig. 4.

Each graph is stored in memory and on tape as one 122-character string. When a graph is saved, all numeric information is converted to string values and is combined with the graph string information and the name string assigned to the graph. When retrieving a graph, the numeric string information is converted back to numeric. To save time when reading and writing to tape, each read/write is of two graphs combined into one 244-character string. The layout of the 122-character graph string is shown in Fig. 5.

The menu routine starts on line 100. This is the main driver of the program. It displays the menu and then, depending on the key pressed, issues a GOSUB to perform one of the four main functions. If the End option is selected, it checks to see if the graphs in

memory have been updated, and if they have, it gives you a chance to save memory on tape before ending.

The load data tape routine starts on line 1000. The first record read is the number of graphs on the tape. The data is then read in as 244-character strings, two graphs to a string, and stored in memory.

The write data tape routine starts on line 4000. It does the opposite of the read tape routine, writing out the number of graphs and then writing out the contents of the graph table, combining every two graphs into one 244-character string.

The build new graph routine starts on line 1400. It prints the graph-building questions and accepts the information entered. Because the questions are printed on the bottom line and inputting data on the bottom line causes line feed, the input statement cannot be used. All the data is entered using the INKEY\$ subroutine that starts on line 14000. It is described below. All of the graph drawing is done by GOSUBs to graph drawing routines. The inputting of values is also done by subroutine.

The retrieve graph routine starts on line 2500. It first displays the names of all the graphs in memory and then, using the INKEY\$ routine, accepts the name chosen. Lines 2800-3100 are a binary search of the graph table for the chosen name. If the name is not found, an error message is displayed and another choice is asked for. When the graph data is found, it is decoded

and the graph variables are set up. GOSUBs are issued to draw the graph.

At the end of both the new graph and retrieve graph routines is a GOSUB 7500. Starting in line 7500 is the graph function routine. It displays the graph title and an asterisk and then goes into an INKEY\$ loop to accept commands. Depending on the key hit, it issues GOSUBs to perform the various graph functions or returns to the calling routine. When it is about to issue a GOSUB, it blanks out the asterisk.

The save routine starts on line 7700. If the graph is new, it asks for a name for the graph and uses the INKEY\$ routine to accept the input. For both old and new graphs, the graph data is then encoded and stored in memory. An old graph is stored in the same location it was retrieved from. For a new graph the graph table is stepped through, each entry being shifted down one position, and the new graph is inserted right before the entry it is greater than. If the new name is already in memory, all the down-shifted table entries are shifted back and an error message is displayed.

The switch routine starts on line 8700. It first issues a GOSUB to the clear graph routine to blank out the graph area and replot the points. It then switches the graph type and issues the GOSUBs to draw the new typed graph.

The add value routine starts on line 9100. It checks the value label table and finds the first empty value. It then issues a GOSUB to the enter label and value routine to accept the value and label being added and then issues a GOSUB to draw the graph with the added value.

The change value routine starts on line 9500. It asks for the label of the value to be changed and then searches the label table for it. If the label is not found, an error message is displayed. When the label is found, it issues a GOSUB to the Enter value routine, replaces the value in the value table, and then issues GOSUBs to the clear graph routine and the graph drawing routines to draw the graph with the new value.

The delete routine starts on line 10000. It checks the new graph switch and if it is a new graph, it displays an error message. If it is an old graph, it is deleted by shifting all the table entries below it up one position.

The draw line graph routine starts on line 5000. This routine determines the length and number of small line segments needed to draw a balanced, proportional line between two points on the graph, and then draws it. The routine is divided into three separate areas. Line 5300 handles point differences of zero, one, two and six. Lines 5350-5550 handle differences of three, four and five and lines 5600-6200 handle differences over six. The six and under differ-

*“...to incorporate graphing into an existing program...
add the modules you need...”*

ences are drawn as unique situations. The over six differences are each calculated separately. The over six routine calculates how many middle line segments are needed and how long they will be. Any leftover amounts are divided between the top and bottom of the line. Line 5600 performs the calculations that result in the following variables:

- D2 = Length of middle line segments;
- D3 = Number of middle line segments;
- D4 = Length of end line segments;
- D5 = Number of end segments (to be decremented);
- D6 = Number of end segments (not to be decremented).

The routine then uses these variables to draw the line, splitting the end segments between the top and bottom of the line. In all cases D¹ is the direction of the line, minus one for up or plus one for down.

The bar graph routine starts on line 11000. It is a straightforward Set loop, Setting all coordinates between the point and the X axis. The layout X and Y axis routine starts on line 7000. It draws the X and Y axis on the screen with Set loops. The Y axis routine starts on line 10500. It displays the Y range numbers, the Y label and the Y multiplier on the screen. The label and plot value routine starts on line 10700. It displays the value label and performs the Sets to plot the point on the screen.

The assign label and value routine starts on line 11300. It asks for the value label and

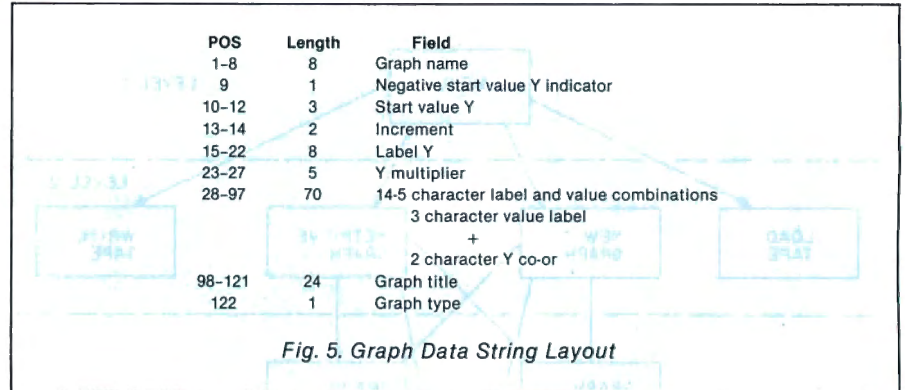


Fig. 5. Graph Data String Layout

the value. It issues a GOSUB to the Y calculate routine and then stores the label and value coordinate in their respective tables. It then issues a GOSUB to the label and plot routine.

The Y calculate routine starts on line 12000. It calculates the Y coordinate value that is closest to the Y range value that was entered.

The clear graph routine starts on line 8900. It prints long space strings to blank out the graph area, and does Sets and Resets to clean up the X axis. It then issues GOSUBS to replot the points.

The encode numerics routine starts on line 8550. It converts a numeric graph variable into a specified length string and then

combines the string with the total graph data string. C3 is the length of the string, which is set up by the calling routine.

The INKEY\$ routine starts on line 14000. It is an INKEY\$ loop that builds a string of characters of the keys hit. It also prints each character as its key is hit. CI is the print location, which is initialized by the calling routine. If a backspace (ASC 8) is detected, the last character is deleted from the string, the last character printed on the screen is spaced out and CI is decremented by one. If an Enter (ASC 13) is detected, the subroutine stops and returns to the calling routine.

Final Comments

This program has been designed as a general-purpose graph utility program able to draw and maintain a wide variety of different graphs. However, if you want to incorporate graphing into an existing program or one you are writing, you can also use this program. Because each routine is a separate module, you can just add the modules you need to your program to generate your specific graph. If your program generates the values to be graphed, you can have it load the value table and then issue the GOSUBS to draw the graph.

The program should also be very useful in helping to teach children about graphs. For example, the change value function lets them see how different values change the appearance of the graph and the switch function shows them how a bar and line graph show the same information in different ways.

If you want to store your graphs on disk, just rewrite the load data and write data routines to read and write to disk. No other changes should be needed.

A final note: Don't use Break to end the program. Option five on the menu will end the program normally and if you have saved graphs in memory, it will remind you to save them on tape. If you use Break, you could lose the graphs you've stored in memory. ■

Variable	Type	Description
I	String	Primary string I/O
C	Integer	Primary numeric I/O
II-In	String	Intermediate strings
C1-Cn	Integer	Intermediate integer values
CT	Integer	Counter
SW	String	Graphs updated switch
M(50)	String	Graph data table
CM	Integer	Total graphs in memory
VY	Integer	Start value Y
CN	Integer	Increment value
LY	String	Label Y
MY	String	Y multiplier
PW	String	End inputting values switch
TI	String	Graph title
TY	String	Graph type
NS	String	New graph switch
CP	Integer	Graph name print position
NA	String	Graph name
D1-Dn	Sing-pre	Calculation variables
LV(14)	String	Value label table
Y(14)	Integer	Value Y co-or table
DF	Integer	Point to point Y difference
DI	Integer	Line direction
CX	Integer	Set X co-or
CY	Integer	Set Y co-or
CL	Integer	Current graph table location
F	Sing-pre	Single precision input
YI	Integer	Subscript for draw line routine
BL	String	Blank line

Fig. 4. Program Variables

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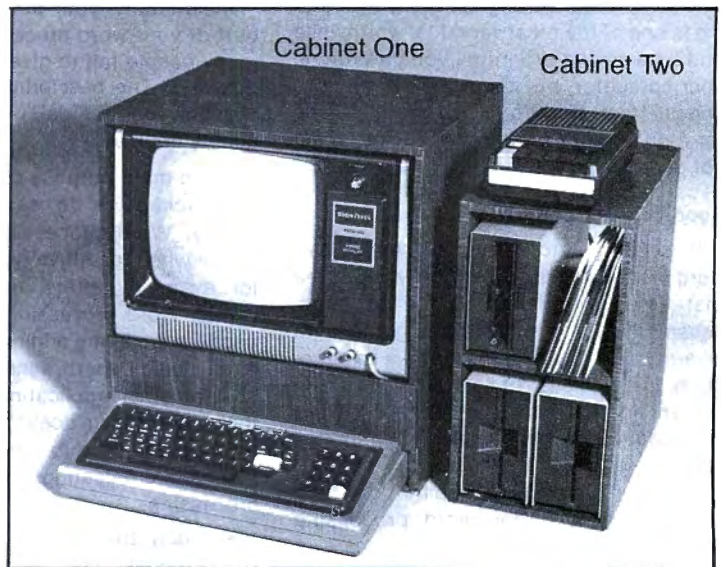
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It is difficult to define a good or bad word processing program. Many will agree that when a program is full of bugs, doesn't live up to its advertising and is an all-around letdown—yes, that's a bad program. But, like a lot of software, good is in the application of the beholder. A word processing program may be perfect for one user and lousy for another.

Here are five simple steps that can help you choose a better word processing package:

- Always select a word processing program that will fit your needs—both present and future. You may not always be able to find an off-the-shelf program that will do everything you want it to do, but you should be able to come close. The bottom line: Choose a word processing program that will get all of your jobs done.

- Your program should be flexible enough so that it can grow as your applications grow. If you think that in the future you'll need to create more than just form

letters with your system, make sure your software can complement your needs.

- The word processing program you choose should fit the capabilities of your present inventory of hardware. Ideally, your program should grow as you improve your system. If the software includes fancy graphics, along with underlining, boldface and justified margins, it won't do you much good if you own a modified IBM Selectric.

Incidentally, your printer is an integral part of your word processing system, but many people fail to give it the attention it deserves. The best printers for word processors are the daisy-wheel or a high-quality dot matrix.

- The main purpose of a word processing package is to save you time and money. Word processing is particularly useful when repetitive typing is necessary; for example, letters, reports and documents. Word processing software is also good for preparing original manuscripts (no more Liquid Paper!), sending out bills and a host of other applications. It's important that your program doesn't slow you down. If it takes less time to type it out manually, then you're defeating the purpose of word processing.

- Finally, the program should be easy to use. A complicated program may be fine for someone well versed in computers, but it's out of place for the average user. Some programs require a certain knowledge of computers to operate properly. Make sure you (and your operator) can use the program to its fullest.

However, a complicated program doesn't always mean a complicated operation. Many programs jammed with goodies are far simpler to use than some that do nothing more than print out form letters.

The documentation supplied with the software is another important consideration. Some are written with technical jargon understood only by computer engineers; others are written for the rest of us. Tutorial aids, such as audio cassettes, can also be a real help when learning to use the program.

Inside a Word Processor

In order to choose the best word processing program for your particular needs, it is important that you understand the features common to most word processing software. You may find you don't need some features; others you might not be able to do without. Following are several important features that you should consider in your quest for the perfect word processor.

User-defined Video and Printing

You should be able to change the way a document will appear on the page when it is printed. In addition, altering the appearance of the text in the video monitor helps in preparing and editing non-standard documents.

Normally, the computer will set up all screen and printer formats when you start up the system. It will assume you want to use the program in the normal fashion. These are called *defaults*, and unless you tell the computer otherwise, it will perform all of the functions as originally designed.

A word processing program capable of printing documents only on standard 8½ by 11 paper will be of little use to an attorney or others who use a larger paper size.

Cursor Control

The ease with which you can position the cursor for writing and editing the docu-

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Flexible, powerful data structuring capabilities: network and hierarchical data structures, including direct many-to-many relationships (not available elsewhere).

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Dynamic data base restructuring...and many other advanced data base management features.

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for your system?**

MDBS is written in Z-80 machine language and runs under TRSDOS or NEWDOS with TRS DISK BASIC; under CP/M® (and similar derivatives) with CBASIC2, PL/1, PASCAL Z, PASCAL M, PASCAL MT+, BDS C, CIS COBOL, and Microsoft COBOL, FORTRAN, or BASIC.

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“Global editing is a boon for indexing, form letter preparation, specification typing and many other documents.”

ment is a feature often overlooked. The longer the document, the more tedious it will be to position the cursor. Some programs move the cursor only one character and one line at a time. Others flip through the document from beginning to end, go back and forth from the start to the end of a line, and so forth. If you need to work with lengthy documents, it might be a wise idea to stay away from a program that has limited cursor control.

Wrap-around

You may notice that on most word processing programs you don't need to push Enter when you finish a line. If a word

exceeds the maximum screen width, it will wrap around onto the next line.

Local Edit

Local editing refers to one-at-a-time changes. The simplest form of editing is the strikeover. If you make a typo, you merely position the cursor over the wrong letter and retype the word correctly.

Other local editing features include single word delete or insert and line delete and insert. If you need to take out a word, position the cursor on the first character and push the Delete key. The word is erased and all of the text closes up to fill the gap. The words re-wrap as needed to

make it tidy and neat.

Global Editing

Let's say you must change a person's name throughout a lengthy document. Instead of tediously looking for each occurrence and making the changes manually one at a time, you can instruct the computer to perform a global replace function. You tell the computer what name to find and what to exchange it with.

Other global functions are search (or find) and delete. Global editing is a boon for indexing, form letter preparation, specification typing and many other documents.

Header and Footer

There may be times when you need to include a title or your name on each page. A header will place this information on the top of the page; a footer on the bottom. You can also select this function to occur only on odd or even-numbered pages (when a document is printed on both sides of the paper, for example).

Auto Pagination

Since it is often difficult to determine when one page will stop and another will begin, a program that automatically numbers the pages can be very handy. Many programs enable you to begin numbering at any point in the document and place it anywhere you wish in the top or bottom margin.

Margins

In addition to being able to select the amount of margin space on the top, bottom, left and right sides of the paper, your word processing program might also be capable of:

- Flush right margins—where the standard even margin is on the right side, not the left.
- Justified—both side margins are even. Space is added between words to spread out the lines when necessary.
- Centered—each line is centered on the page.
- Vertical centered—where the entire document is placed neatly in the middle of the page. No more top-heavy letters!

Page Scroll and Line Scroll

Depending on how your program “sees” the text, you'll be able to go through the

	Letter Writer Astro Star Enterprises	Write-Righter Triffler Software	Word Processing Jerry Lee Software	Word Processor Blanton Software Service	CPT-80 Bits & Bytes Software	The Word Worker Design Enterprises	Script Radio Shack	The Electric Pencil Michael Shrayer Software
Line Oriented								
Page Oriented								
Expanded Cursor Con.								
User Defined Video								
User Defined Print								
Underlining								
Boldface								
Character I/D								
Word I/D								
Line I/D								
Global Replace								
Global Search								
Global Delete								
Headers & Footers								
Auto Pagination								
Hyphenation								
Selectable Tabs								
Block Manipulation								
Flush Right Margin								
Justification								
Centering								
Vertical Centering								
Merging								
Menu Driven								
Tutorial Aides								
Free Updates								
Modification Req'd.								

Table 1

"Merging, in this case, has nothing to do with Wall Street or big business."

document either one line at a time, or entire pages at once (screen pages; usually only one third or one fourth the amount of copy of a printed page).

Tabs and Indenting

Many programs enable you to select a tab stop at every character position. Others have pre-selected tabs, usually at five or 10 spaces apart. Many programs will indent at the beginning of each new paragraph. Few programs will allow you to have each line indented, as when preparing outlines and specs.

Block Manipulation and Merging

A block is any large amount of text. Whenever you need to alter entire segments, block manipulation will come in handy because you won't have to retype the text. If you need to change the position of a particular paragraph from the beginning to the end of a document, you begin by placing block markers around the paragraph, then tell the computer where you want the text to be moved.

Merging, in this case, has nothing to do with Wall Street or big business. It is a highly useful feature that enables the operator to send out items such as personally addressed form letters in a minimum amount of time.

First, you create a primary document and insert variable commands wherever in-

formation is to be changed. On the secondary document, you include names, addresses, account numbers and balances (or whatever). When you merge the two, the information from the second file will be inserted into the proper slots in the text of the primary document.

Merging is a feature many programs don't have, but it is something you can buy as an add-on to your present word processing program.

Modification Requirements

A few of the programs recommend certain hardware modifications (in addition to the standard upper/lowercase modification for the Model I). You'll need to consider this very carefully, especially if you have a new machine which is still under warranty. Opening up the keyboard and adding hardware will definitely void the warranty.

Priorities

How do you go about deciding what you'll need in a word processing program? First, examine the type of documents you'll be preparing. Cross reference these with features that you must have to accomplish the work. If you want, put a point value on the importance of each feature.

Then compile a similar list, this time jotting down features you'd like to have, but which are not absolutely necessary to

carry out what you need. Assign a point value to these also.

Compare your lists with the programs available on the market. Those most needed features will be on the top of the list, and software that fails to pass should be dropped from the race.

After this process of elimination, you should have one or two programs that will suit your needs. Contact the nearest supplier of the program and see if you can arrange a demonstration. Since software is something you usually can't return, it's a good idea to be absolutely sure you know what you're getting.

To make your search a little easier, we've compiled a list of several word processing programs available for the Models I and III. We sent out a detailed questionnaire to about two dozen software houses and those that responded have been included here. Undoubtedly, there are many other programs available, but this cross-reference chart should steer you in the right direction in determining which software will be best for your particular application.

To some, word processing seems like a luxurious fad. People have been banging out letters on typewriters for almost 100 years. Why not 100 more? But we guarantee, if you try out a good word processing program, you'll wonder how you ever got along without it! ■

OMNITERM

What is OMNITERM?

OMNITERM is a professional communications package for the TRS-80 that allows you to easily communicate and transfer files or programs with almost any other computer. We've never found a computer that OMNITERM can't work with. It's a complete package because it includes not only the terminal program itself, but also conversion utilities, a text editor, special configuration files, serious documentation and serious support.

Why do I need it?

You need OMNITERM if you need to communicate efficiently with many different computers, or if you want to customize your TRS-80 for use with one particular computer. You need OMNITERM to SOLVE your communications problems once and for all.

What do I get?

The OMNITERM package includes the OMNITERM terminal program, four conversion utilities, a text editor, and setting files for use with popular computers such as CompuServe, the Source, and Dow Jones — just as samples of what you can

The ULTIMATE TRS-80 Terminal Package

do for the computer you want to work with. The package includes six programs, seven data files, and real documentation: a 76-page manual that has been called "the best in the industry." And OMNITERM comes with real user support. We can be reached via CompuServe, Source, phone, or mail to promptly answer your questions about using OMNITERM.

What do I need to use OMNITERM?

A Model I or Model III TRS-80, at least 32K of memory, one disk, and the RS-232 interface. OMNITERM works with all ROMs and DOSes, and will work with your special keyboard drivers.

What will it do?

OMNITERM allows you to translate any character going to any device: printer, screen, disk, keyboard, or communications line, giving you complete control and allowing you to redefine the character sets of all devices. It will let you transfer data, and run your printer while connected for a record of everything that happens. OMNITERM can reformat your screen so that 80, 32, or 40 column lines are easy to read and look neat on your TRS-80 screen. It even lets you get on remote computers with just one keystroke! The program lets you send special characters, echo characters, count UART errors, configure your UART, send True Breaks and use lower case. It accepts VIDEOTEX codes, giving you full cursor control. It will even let you review text that has scrolled off the screen! Best of all, OMNITERM will save a special file with all your changes so you

can quickly use OMNITERM on any one of many different computers by loading the proper file. It's easy to use since it's menu driven, and gives you a full status display so you can examine and change everything.

"OMNITERM has my vote as the top TRS-80 terminal program available today" Kilobaud Microcomputing, June 1981, pages 16-19.

OMNITERM is \$95 (plus shipping if COD) Call for 24 hour shipment. Manual alone \$15, applied toward complete package. Visa, M/C, and COD accepted. MA residents add 5% tax. Dealer inquiries invited.

Contact Lindbergh Systems for your custom programming needs. We are expert at writing software to work with YOUR hardware, in assembler, high-level language, or Fort.

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Model 321 - 350 Kbyte

\$1,895.00

• 48K Model III with two Tandon 40-track single-headed double density disk drives • system includes TRSDOS, dust cover and one box of Verbatim diskettes

Model 322/3 - 700 Kbyte

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Model 324 - over 1.4 Mbyte

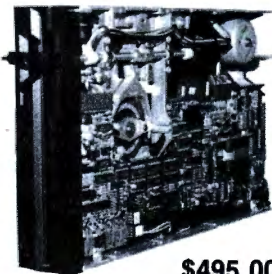
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• our largest all-in-one Model III provides over 1.4 Mbytes of floppy disk storage with two Tandon double-headed 80-track drives • 48K Model III system includes LDOS, dust cover, box Verbatim diskettes

We now carry complete business software from SBSG, Galactic, PROSOFT, Radio Shack, many others

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TM848-1

\$495.00

Single-sided 77-track - Storage: 600K single density, 1.2 Mbyte double density

TM848-2

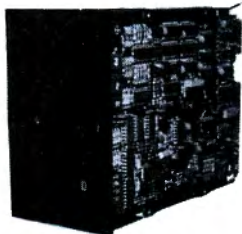
\$595.00

Double-sided 77-track - Storage: 1.2 Mbyte single density, 2.4 Mbyte double density

Complete Model II expansion bay system will be announced soon.

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TM602S

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3-ms access time - 612 tracks - 5 Mbytes/s data transfer rate - 6.38 Mbyte RPM capacity (unformatted)

TM603S

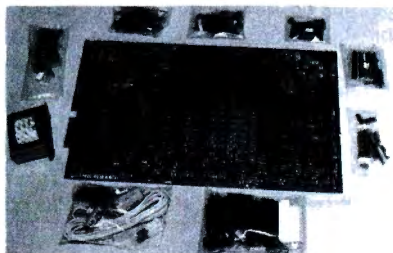
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3-ms access time - 918 tracks - Mbytes/s data transfer rate - 9.57 Mbyte RPM capacity (unformatted)

Complete Model I and III systems will be announced soon.

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The new MDX-2 from Computex provides more capabilities than any other system expansion currently available. • build only what you need • silk-screened and solder-masked PCB • dip switch instead of hardware jumpers • no messy vertically-mounted termination resistors.



complete kit
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- MDX02 printed circuit board..... **\$74.95**
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- Floppy disk controller kit..... 31.95
- 32K RAM expansion kit (less RAM)..... 11.95
- Cassette port..... 3.95
- Analog power supply..... 29.95
- Hardware and socket kit..... 19.95
- Centronic line printer port..... 8.95
- 16K Ram memory..... 14.95

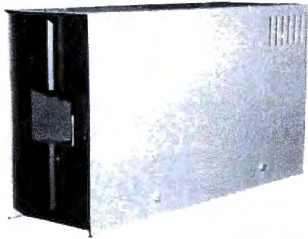
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Comprehensive Test Program **\$21.95**

As a leading supplier of disk drives and TRS80 systems, we had to have a system test program - and one that we could trust. Since none existed, we wrote our own. Now we make it available to you. A must for disk drive users - no library should be without one.

- disk drive speed test • disk drive alignment program (requires alignment disk - Dysan Alignment Disk \$39.95) • expansion interface RAM test • keyboard RAM TEST • video RAM test • keyboard bounce test • ROM checksum program • full screen RAM display program

TANDON DISK DRIVES



- Fast 3-5-ms track-to-track access time
- Single or double density operation
- Total compatibility with Model I or III
- Pre/post testing during 48-hour burn-in
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DRIVES WITH CASE
& POWER SUPPLY

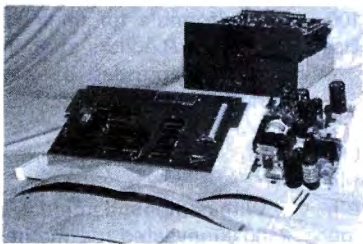
\$299.95	TM100-1 - single-sided 40-track drive - 102 Kbytes single density 180 Kbytes double density	\$235.00
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\$399.95	TM100-3 - single-sided 80-track drive - 204 Kbytes single density - 360 Kbytes double density	\$335.00
\$499.95	TM100-4 - double-sided 80-track drive - 408 Kbytes single density - 735 Kbytes double density	\$435.00

DRIVES W/O CASE
& POWER SUPPLY

2-drive cable - \$24.95 • 4-drive cable - \$34.95 • drive extender \$14.95

MODEL III DISK DRIVE EXPANSION KITS

- Switching power supply • storage to 2 Mbytes • supports TRSDOS, LDOS, DOS+, and new DOS80
- 32K RAM expansion • double density disk controller • goldplated edge card connections • includes TRSDOS and manual, all cables and necessary hardware, installation manual • fully tested and burned in • 90-day warranty



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M3DK2 - Drive kit with two Tandon double-sided 40-track drives	\$995.00
M3DK4 - Drive kit with two Tandon double-sided 80-track drives	\$1,195.00

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All components to assemble LNW color computer - high resolution video RAM and 16K user RAM - keyboard - level II compatible ROM's. (does not include PCB)

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All components to assemble LNW expansion interface, plus 32K of RAM. Does not include PCB, dual cassette relay or cabinet.

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Check the menu for the business program you want.

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Groups of programs are often combined into one larger program using the menu technique. The individual programs can be of fairly diverse applications, but usually have a central theme. For example, in a statistics package you might find programs ranging from simple descriptive statistics to the most complex multi-variate analysis programs.

Menu

Let's assume a brief package of three financial routines. First, clear the screen.

Then a series of statements print the menu (See Table 1). Put the name and number of more routines starting in line 19 of Program Listing 1.

Number the three routines at lines 100, 200, and 300 of Program Listing 2. Use On . . . Goto for routine selection.

Compound Interest

When only the principal earns interest for the entire life of a deposit or loan, the interest due at the end of the time is simple interest. Invest \$100.00 at five percent per year simple interest. At the end of the year you have \$105.00. At the end of the second year you have \$110.00; the \$5.00 interest in the first year is not added to the principal, and draws no interest. Minor problems are caused by different numbers of days in the months and years, but the principal earning interest remains unchanged throughout the life of the loan or deposit.

Compounding (interest due is added to the principal) results in different interest payments. Different principal amounts are used to calculate the interest.

The formula for finding the value of a deposit of P dollars at an interest rate of i percent (expressed as a decimal) for n periods is fairly simple:

$$V = P(1 + i)^n$$

With compound interest, the value of the \$100.00 invested for one period at six percent is the same as when using simple interest—\$106.00. During the next period the entire \$106.00 earns interest at six percent, making the amount at the end of two periods \$112.36 instead of the \$112.00 with simple interest.

Our simple formula does not apply to quarterly or daily compounding. The formula for this type of problem is:

$$V = P(1 + \frac{i}{c})^{nc}$$

```

10 PRINT
11 PRINT "*** HONESS FINANCIAL PACKAGE ***"
12 PRINT
13 PRINT "PROGRAM          ENTER "
14 PRINT "-----          -----"
15 PRINT
16 PRINT "COMPOUND INTEREST      1  "
17 PRINT "DISCOUNTED PRESENT VALUE  2  "
18 PRINT "DEPRECIATION           3  "
30 PRINT
31 INPUT "WHICH DO YOU WANT?"; N
    
```

Program Listing 1

*** HONESS FINANCIAL PACKAGE ***	
PROGRAM	ENTER
COMPOUND INTEREST	1
DISCOUNTED PRESENT VALUE	2
DEPRECIATION	3
WHICH DO YOU WANT?	

Table 1

MULTI-USER OASIS HAS THE FEATURES PROS DEMAND. READ WHY.

Computer experts (the pros) usually have big computer experience. That's why when they shop system software for Z80 micros, they look for the big system features they're used to. And that's why they like Multi-User OASIS. You will too.

DATA INTEGRITY: FILE & AUTOMATIC RECORD LOCKING

The biggest challenge for any multi-user system is co-ordinating requests from several users to change the same record at the same time.

Without proper co-ordination, the confusion and problems of inaccurate or even destroyed data can be staggering.

Our File and Automatic Record Locking features solve these problems.

For example: normally all users can view a particular record at the same time. But, if that record is being updated by one user, automatic record locking will deny all other users access to the record until the up-date is completed. So records are always accurate, up-to-date and integrity is assured.

Pros demand file & automatic record locking. OASIS has it.

SYSTEM SECURITY: LOGON, PASSWORD & USER ACCOUNTING

Controlling who gets on your system and what they do once they're on it is the essence of system security.

(THEN COMPARE.)

Without this control, unauthorized users could access your programs and data and do what they like. A frightening prospect isn't it?

And multi-users can multiply the problem. But with the Logon, Password and Privilege Level features of Multi-User OASIS, a system manager can specify for each user which programs and files may be accessed—and for what purpose.

Security is further enhanced by User Accounting—a feature that lets you keep a history of which user has been logged on, when and for how long.

Pros insist on these security features. OASIS has them.

EFFICIENCY: RE-ENTRANT BASIC

A multi-user system is often not even practical on computers limited to 64K memory.

OASIS Re-entrant BASIC makes it practical. How?

Because all users use a single run-time BASIC module, to execute their compiled programs, less

memory is needed. Even if you have more than 64K, your pay-off is cost saving and more efficient use of all the memory you have available—because it services more users.

Sound like a pro feature? It is. And OASIS has it.

AND LOTS MORE...

Multi-User OASIS supports as many as 16 terminals and can run in as little as 56K memory. Or, with bank switching, as much as 784K.

Multi-Tasking lets each user run more than one job at the same time.

And there's our BASIC—a compiler, interpreter and debugger all in one. An OASIS exclusive.

Still more: Editor; Hard & Floppy Disk Support; Keyed (ISAM), Direct & Sequential Files; Mail-Box; Scheduler; Spooler; all from OASIS.

Our documentation is recognized as some of the best, most extensive, in the industry. And, of course, there's plenty of application software.

Put it all together and it's easy to see why the real pros like OASIS. Join them. Send your order today.

OASIS IS AVAILABLE FOR

SYSTEMS: Altos; CompuCorp; Cromemco; Delta Products; Digital Group; Digital Microsystems; Dynabyte; Godbout; IBC; Index; Intersystems; North Star; Onyx; SD Systems; TRS 80 Mod. II; Vector Graphic; Vorimec

CONTROLLERS: Bell Controls; Cameo; Corvus; Kogan; Microstation; Microbits; Tarbell; Telepak; Thinkertoys; X-Comp

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Product	Price with Manual	Manual Only
OPERATING SYSTEM (Includes: EXEC Language; File Management; User Accounting; Device Drivers; Print Spooler; General Text Editor, etc.) SINGLE-USER MULTI-USER	\$150 350	\$17.50 17.50
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where: c is the number of times compounding is to take place in a period
n is the number of periods
i is the interest rate per period n
P is the Principal, and
V is the value at the end of the n periods

Return to the \$100.00 at six percent for 12 years problem and assume quarterly compounding:

$$V = 100.00(1.0 + \frac{0.06}{4})^{(4 * 12)}$$

Quarterly compounding yields \$204.33 compared with \$201.22 under yearly compounding.

Use an Input statement with a literal prompt for each of the values needed:

```
10 INPUT "WHAT IS THE PRINCIPAL";P
```

or combine them all like Program Listing 3.

Run the program for the same principal at the same interest rate, with differing rates of compoundings.

The value of principal subjected to continuous compounding is given by:

$$V = Pe^{in}$$

where: V is the value
P is the principal
e is the base of the common log system and is equal to 2.71828
i is the interest rate
n is the number of periods

The value of \$100.00 compounded continuously at six percent for 12 years is \$205.443, compared to \$204.33 for quarterly compounding and \$201.22 for yearly.

Use the EXP function supplied with most Basic versions to code a program:

```
10 INPUT P,I,N
20 V = P * EXP (I * N)
30 PRINT V
```

AGE	DEPR. CHG.	ACCUMULATION DEPRECIATION	BOOK VALUE AT END OF YEAR
0	0.00	0.00	3600.00
1	525.00	525.00	3075.00
2	525.00	1050.00	2550.00
3	525.00	1575.00	2025.00
4	525.00	2100.00	1500.00
5	525.00	2625.00	975.00
6	525.00	3150.00	450.00

Table 2

The effective annual rate compares the interest you get at different rates, compounded a different number of times per period. For example, suppose you invest \$100.00 at six percent compounded quarterly for 1 year:

$$V = 100 (1 + 0.06/4)^{(1 * 4)} = \$106.136$$

and also suppose you invest \$100 at 6.136 percent compounded annually:

$$V = 100(1 + 0.06136) = 106.136$$

Six percent is the annual rate and 6.136 is the effective annual rate.

This type of calculation is easily coded:

```
10 INPUT "WHAT IS THE NOMINAL INTEREST RATE"; R
20 INPUT "HOW MANY TIMES IS IT COMPOUNDED/YR"; N
30 I = (1 + R/N)^N - 1
40 PRINT I
```

Present Value

Present value is the value of a debt on a

```
10
.
. headings, menu, etc.
.
30
31 INPUT "WHICH DO YOU WANT"; N
40 ON N GOTO 100, 200, 300
50 GOTO 31
100
.
. compound interest routine
.
199 GOTO 900
200
.
. discounted present value routine
.
299 GOTO 900
300
.
. depreciation routine
.
399 GOTO 900
.
. any other routines you add go here. (add to line 40 also)
.
.
900 INPUT "WANT TO RUN AGAIN--(1 = YES, 0 = NO)"; X
910 IF X = 1 GOTO 10
920 IF X = 0 GOTO 999
930 GOTO 900
999 END
```

Program Listing 2

```
10 PRINT " ENTER PRINCIPAL, INTEREST (DECIMAL),
11 PRINT " NO. OF COMPOUNDINGS PER PERIOD, AND "
12 PRINT " NO. OF PERIODS"
13 PRINT
14 PRINT " EXAMPLE:"
15 PRINT " $100.00 INVESTED FOR 12 YEARS AT "
16 PRINT " 6% PER YEAR, COMPOUNDED QUARTERLY, "
17 PRINT " WOULD BE ENTERED AS:"
18 PRINT
19 PRINT " 100.00,0.06,4,12 "
20 INPUT P,I,C,N
```

Program Listing 3

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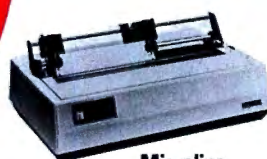
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"The amount of depreciation each year reduces the taxable income, as you recover your cost. . ."

date earlier than the due date.

Suppose I agree to pay you \$1000.00 a year from now. Money is now earning six percent. What is the present value of the debt? You should settle for less than the \$1000.00 you will get a year from now. You can invest the amount today at six percent and have your \$1000.00 at the end of the year. This is almost the same problem as compound interest; now we know V and solve for P.

The formula:

$$P = V(1+i)^{-n}$$

```

10 INPUT "WHAT IS THE COST OF THE ASSET "; C
20 INPUT "WHAT IS THE SALVAGE VALUE "; SV
30 INPUT "HOW MANY YEARS DEPRECIATION"; N
40 PRINT
50 PRINT " print your headings here "
60 PRINT
70 A=0
80 DC=0
90 DF=0
100 BV=C
110 PRINT A, DC, DF, BV
120 DC=(C-SV)/N
130 FOR A = 1 TO N
140 DF=DF+DC
150 BV=BV-DC
160 PRINT A, DC, DF, BV
170 NEXT A
  
```

Program Listing 4

is only slightly different than the compound interest formula. Recall that:

$$x^{-3} \text{ is the same as } \frac{1}{x^3}$$

When you compound at more than one time per period, the formula reflects this:

$$P = V(1 + \frac{i}{c})^{-nc}$$

where c is the number of times compounding takes place per period.

What amount must be invested now to yield \$1000.00 at six percent compounded quarterly, 12 years from now?

$$\begin{aligned}
 P &= 1000.00 (1 + \frac{0.06}{4})^{-(4 \cdot 12)} \\
 &= 1000.00 (\frac{1}{(1 + \frac{0.06}{4})^{(4 \cdot 12)}}) \\
 &= 1000.00 (\frac{1}{1.01548}) \\
 &= 1000.00 * (1/2.04348) \\
 &= \$489.36
 \end{aligned}$$

Check this result with the compound interest program and formula. The value 489.36 invested for 12 years at six percent compounded quarterly yields \$1000.00. The

present value program follows:

```

20 INPUT V,I,C,N
30 P=V*(1/((1+I/C)^(C*N)))
40 PRINT V
  
```

Depreciation

As an asset is used it loses value. The asset has to be replaced at the end of its useful life. Consider a company setting aside a portion of its earnings in a depreciation fund. Actually, the amount of depreciation each year reduces the taxable income, as you recover your cost during the asset's useful life. The straight-line method for depreciating an asset is simplest. Suppose a machine costs \$3600.00 and has a useful life of six years. At the end of the six

```

10 INPUT "SCRAP VALUE OF ASSET" ="; SV
20 INPUT "COST OF ASSET" ="; C
30 INPUT "NO. OF YEARS TO DEPRECIATE" ="; N
40 A=SV/C
50 D=0.001
60 T=1-D
70 B=T*N
80 IF A > B THEN 110
90 D=D+0.001
100 GOTO 60
110 PRINT "RATE OF DEPRECIATION" ="; D
  
```

Program Listing 5

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“Seldom is an asset depreciated the same amount in its first year as in one of the later years of its life.”

years, the machine has a scrap value of \$450.00.

$$\text{Average yearly depreciation} = \frac{3600 - 450}{6} = \$525.00$$

Table 2 shows the yearly depreciation charge, the amount accumulated in the depreciation fund, and the book value of the machine at the end of each year:

The book value drops to the salvage value at the end of six years. The accumulated depreciation plus the book value at the end of the year always equals the cost.

Program Listing 4 prints this table. Code the headings as you like; commas between the variables space the printing in the first four fields.

There are some serious problems with the straight-line depreciation method. Seldom is an asset depreciated the same amount in its first year as in one of the later years of its life. Consider your automobile, for example. You would like to depreciate it more the first year than the second, more the second than the third, and so on. (Tie this to the concept of Present Value. The more you depreciate the car early in the useful life, the more tax savings you get and also the more money you can earn on that depreciation fund money at compound interest.) You want to keep the book value in line with the real value of the car at the end of each year. Overcome this problem by calculating the depreciation charge as a fixed percentage of the book value each year, known as the constant-percentage (or declining-balance) depreciation method.

In the constant-percentage depreciation method, assume an original cost C, and a fixed depreciation percentage d, so that the depreciation charge is Cd at the end of the first year, and the book value is: C - Cd, which equals C(1 - d). At the end of the second year, the depreciation charge is C(1 - d)d and the book value is:

$$C(1 - d)^2$$

AGE	BOOK VALUE AT END OF YEAR	DEPRECIATION CHARGE	ACCUMULATED DEPRECIATION
0	3600.00	0.00	0.00
1	2545.20	1054.80	1054.80
2	1799.46	745.74	1800.54
3	1272.22	527.24	2327.78
4	899.46	372.76	2700.54
5	635.92	263.54	1964.08
6	449.59	186.33	3150.41

Table 3

In other words, the book values for the first n years are:

$$C(1 - d), C(1 - d)^2, C(1 - d)^3, \dots, C(1 - d)^n$$

Since the book value at the end of n years is the scrap value, we can say:

$$SV = C(1 - d)^n$$

Consider the same problem: a \$3600.00 machine with a useful life of six years and a scrap value of \$450.00. If we substitute what we know into the equation, we have:

$$450 = 3600(1 - d)^6$$

or:

$$(1 - d)^6 = 450/3600 = 0.125$$

solve for d, use logs:

$$6 \log(1 - d) = \log 0.125$$

We run into trouble in the Basic program on several different fronts. If your computer has only base e logs, convert from base 10 with:

$$\log_b(X) = \log_e(X) / \log_e(b)$$

To find the base 10 log of 0.125 with a base e log function, you could say:

$$LG = \text{LOG}(0.125) / \text{LOG}(10)$$

When we start working with:

$$6 \log(1 - d) = \log 0.125$$

we eventually must find an anti-log. I use the iteration technique.

Suppose we just set d equal to 0.01 and try it in our formula:

$$(1 - 0.01)^6 = 0.94$$

Because 0.94 is not the 0.125 we would like, 0.01 must be wrong. Let's try 0.02:

$$(1 - 0.02)^6 = 0.88$$

A little closer, but not 0.125. As the value of d goes up, the answer goes down. In the iteration technique, start at some very small value (0.001) and compare the answer to what it should be (in this case, 0.125). If our guess is too low, the answer is more than 0.125. Add a small number to d and try again until the answer equals 0.125. At that time we have a good approximation of d (See Program Listing 5).

Lines 10 through 30 allow us to input the values for the calculations. Line 40 calculates the number we want to approximate in the iteration technique (0.125 with the data from the example problem). In line 50 we start with a d value of 0.1 percent. You can make this and the incremental value in line 90 smaller if you like. These values allow reasonable running times, and produce rates of depreciation accurate to the third decimal place. Line 60 calculates T; (which I named "T" to stand for "Term") line 70 raises this term to the nth power and calls it B. Line 80 compares B to A; if A is greater than or equal to B, D is printed. If A is less than B the program adds 0.001 to D and tries again.

The book value is 41¢ off, as is the amount in the accumulated depreciation at the end of the six years (See Table 3). The value of D is slightly inaccurate; the iteration technique only found a good approximation. If you want greater accuracy (and are willing to wait for it while your program finds d) increment d by 0.0001 or 0.00001 in line 90.

Program Listing 6 makes the table. Insert your own headings.

Here we calculated the book value first and subtracted the new book value from the

```

120 AG=0
130 DC=0
140 DF=0
150 BV=C
160 PRINT AG, BV, DC, DF
170 FOR AG=1 TO N
180 X=C*(1-D)^AG
190 DC=BV-X
200 DF=DF+DC
210 BV=X
220 PRINT AG, BV, DC, DF
230 NEXT AG
    
```

Program Listing 6

AGE	DEPRECIATION CHARGE	ACCUMULATED DEPRECIATION	BOOK VALUE AT END OF YEAR
0	0.00	0.00	3600.00
1	900.00	900.00	2700.00
2	750.00	1650.00	1950.00
3	600.00	2250.00	1350.00
4	450.00	2700.00	900.00
5	300.00	3000.00	600.00
6	150.00	3150.00	450.00

Table 4

"This formula never allows you to reduce the asset balance to zero."

old book value to get the depreciation charge. This is added to the amount already in the accumulated depreciation.

The Sum-of-years-digits method increases the present value of the depreciation tax shield. Assume the same problem: a \$3600.00 machine with a \$450.00 scrap value and a useful life of six years. Depreciate it 6/21 the first year, 5/21 the second year, 4/21 the third year, 3/21 the fourth year, 2/21 the fifth year, and 1/21 the last year. Add all the numerators:

$$\frac{1+2+3+4+5+6}{21} = \frac{21}{21} = 100\%$$

The sum of the "n" integers is given by:

$$\frac{n(n+1)}{2}$$

In our example (where n = 6):

$$\frac{6(6+1)}{2} = \frac{6*7}{2} = \frac{42}{2} = 21$$

Table 4 is produced.

The scrap value is the book value at the end of six years. The depreciation charge in the first year was found by multiplying 6/21 by the amount to be depreciated (cost-scrap value) = 6/21*(3600-450) = 900.00. All values in this equation stay the same each year except the numerator over the 21, which decreases by 1.

Program Listing 7 produces this table. Add headings to suit your self.

The program follows the methods used

before, except for line 110 in the loop. The age (AG) must go from 1 to n but the numerator of the multiplication factor must go from n down to 1. The program calculates a value of UD for each value of AG.

The Double-Declining Balance method of depreciation applies a uniform rate to the remaining book value. Assume that for tax purposes the rate cannot exceed twice the straight-line rate (hence, the "double" in the name). Consider the \$3600.00 machine with the \$450.00 salvage value and the six year life (See Table 5).

The straight-line rate would be:

$$\frac{100\%}{6 \text{ yrs.}} = 16.6667\% \text{ per year}$$

This method allows us to double that, so we will use 33.3333% per year. The \$1200.00

```

10 INPUT "COST OF ASSET" ="; C
20 INPUT "SCRAP VALUE IS" ="; SV
30 INPUT "NO. OF YEARS" ="; N
40 D = 2 * (1/N)
50 AG = 0
60 DC = 0
70 DF = 0
80 BV = 0
90 PRINT AG, DC, DF, BV
100 FOR AG = 1 TO N
110 CD = BV * D
120 DF = DF + DC
130 BV = BV - DC
140 PRINT AG, DC, DF, BV
150 NEXT AG
    
```

Program Listing 7

AGE	DEPRECIATION CHARGE	ACCUMULATED DEPRECIATION	BOOK VALUE AT END OF YEAR
0	0.00	0.00	3600.00
1	1200.00	1200.00	2400.00
2	800.00	2000.00	1600.00
3	533.33	2533.33	1066.67
4	355.56	2888.89	711.11
5	237.04	3125.93	474.07
6	158.02	3283.95	316.05

Table 5

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depreciation in the first year was the result of multiplying the book value of \$36.00 by 0.333333 = 1200.00. The \$800.00 in the second year is 33.333% of 2400.00.

This formula never allows you to reduce the asset balance to zero. The book value cannot fall below the scrap value of the asset before the six years are up. Accountants and tax-payers who favor the high initial write-off in the double-declining-balance method have to convert to some other method (often straight-line) towards the end

of the asset depreciation. The IRS allows you to change from the declining-balance method to the straight-line method any time during the useful life of the asset. The unrecovered cost of the asset, less the estimated salvage value, must be spread over the estimated remaining useful life determined at the time of the change. In many circumstances you may also change from Declining Balance to Sum-of-years-digits, and from Sum-of-years-digits to straight-line depreciation. (See IRS Publication 534.)

Program Listing 8 produces the table. Add your own headings and input prompts.

```

10 INPUT "COST OF ASSET" ="; C
20 INPUT "SCRAP VALUE IS" ="; SV
30 INPUT "NO. OF YEARS" ="; N
40 D=2*(1/N)
50 AG=0
60 DC=0
70 DF=0
80 BV=0
90 PRINT AG, DC, DF, BV
100 FOR AG=1 TO N
110 CD=BV*D
120 DF=BV-DC
130 BV=BVF-DC
140 PRINT AG, DC, DF, BV
150 NEXT AG

```

Program Listing 8

10	81	1	75.00	825.00	9175.00
11	81	2	68.81	831.19	8343.81
12	81	3	62.58	837.42	7506.39
1	82	4	.	.	.
.
.
7	82	10	17.61	882.39	1456.92
8	82	11	10.99	889.01	576.91
9	82	12	4.33	581.24	0.00

Table 6

Loan Amortization Table

If you take out a loan with interest, the loan is amortized when you pay the principal and interest by a sequence of payments at equal intervals of time. The payments are almost always equal, and the time interval is usually one month (see Program Listing 9).

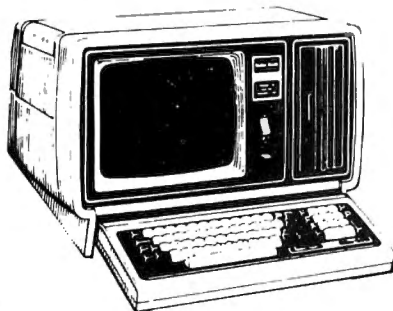
Assume you make the following entries in lines 15 through 35:

10000.00, 0.09, 900.00, 10, 81

You borrow \$10,000.00 at nine percent per year. The payments are \$900.00 per month, and the first payment will be made in October (month number 10) of 1981 (81). The body of the table is in Table 6.

Column 1 is the month number and column 2 is the year. Column 3 is the payment number. Columns 4 and 5 are the portions of the payment applied to the reduction of the principal and the interest on the principal. The first month interest was \$75.00 because $10000 * (0.09/12) = 75$. If the interest is \$75 and you made a \$900 payment, then \$825 is available to reduce the principal. In line 11 of the table the remaining balance is \$576.91, less than a typical \$900.00 payment. In this case pay only \$576.91 plus the interest on the \$576.91, instead of a full \$900.00.

Lines 15 through 35 of Program Listing 8 are the prompted variables input and lines 36 through 41 print the column headings. The Print Using statement lines up the numbers nicely under the headings and prints dollars and cents. Line 42 sets the payment number counter to one. Line 45 finds the interest for this month by multiplying the loan balance by a 12th of the interest rate (assuming monthly payments). Line 50 calculates how much of the payment is applied to the principal reduction by subtracting the calculated interest from the amount of the payment. Line 55 calculates the new out-



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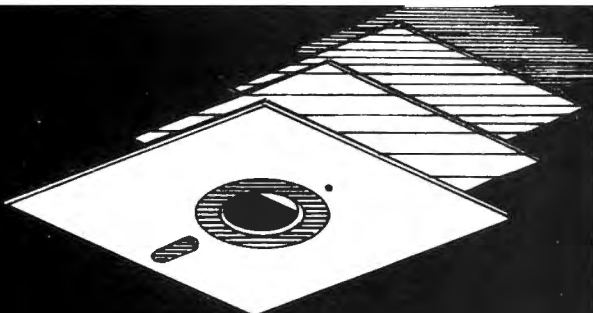
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standing balance. Line 65 checks for an outstanding balance less than the payment. If this is the case, line 400 calculates the

values to be printed for the last payment. If this is not the case lines 70 through 97 add one to the payment number and one to the

month number. If the month number is 13 it is set back to one (January) and the year number is incremented by one. ■

```

10 CLS:PRINT:PRINT TAB(20) "LOAN AMORTIZATION TABLE":PRINT
15 INPUT "LOAN PRINCIPAL = "; P
20 INPUT "INTEREST RATE = "; R
25 INPUT "TOTAL PAYMENT = "; M
30 INPUT "STARTING MONTH = "; MO
35 INPUT "STARTING YEAR = "; YR
36 PRINT
38 AS=" ## #### ## ####.## ####.## ####.##"
40 PRINT"MO YEAR N INTEREST TO PRIN. REMAIN."
41 PRINT
42 N = 1
45 I = P * (R/12)
50 PR = M - I
55 PR = M - I
60 PRIN USING AS; MO, YR, N, I, PR, P
65 IF P + (P * (R/12)) <= M THEN 400
70 N = N + 1

75 MO = MO + 1
80 IF MO = 13 THEN 90
85 GOTO 45
90 MO = 1
95 YR = YR + 1
96 GOTO 45
400 N = N + 1
410 NO = MO + 1
420 IF MO <= 12 THEN 430
422 MO = 1
423 YR = YR + 1
430 I = P * (R/12)
435 PR = P + I
440 P = 0
450 PRINT USING AS; MO, YR, N, I, PR, P
455 PRINT
999 END

```

Program Listing 9

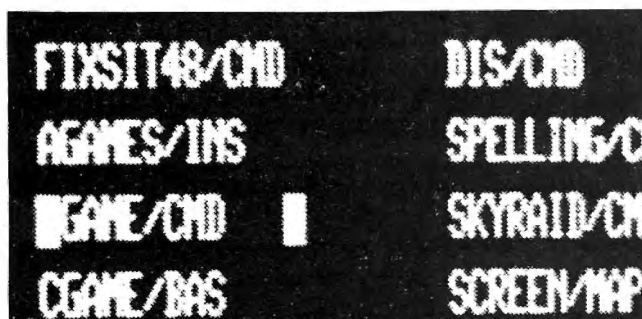
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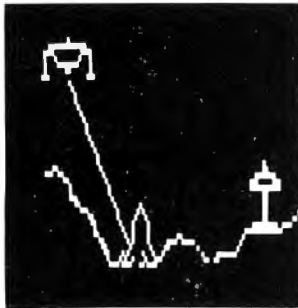
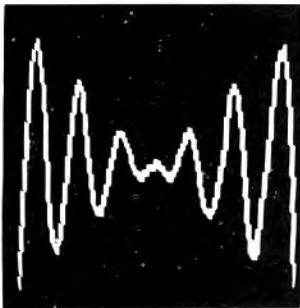
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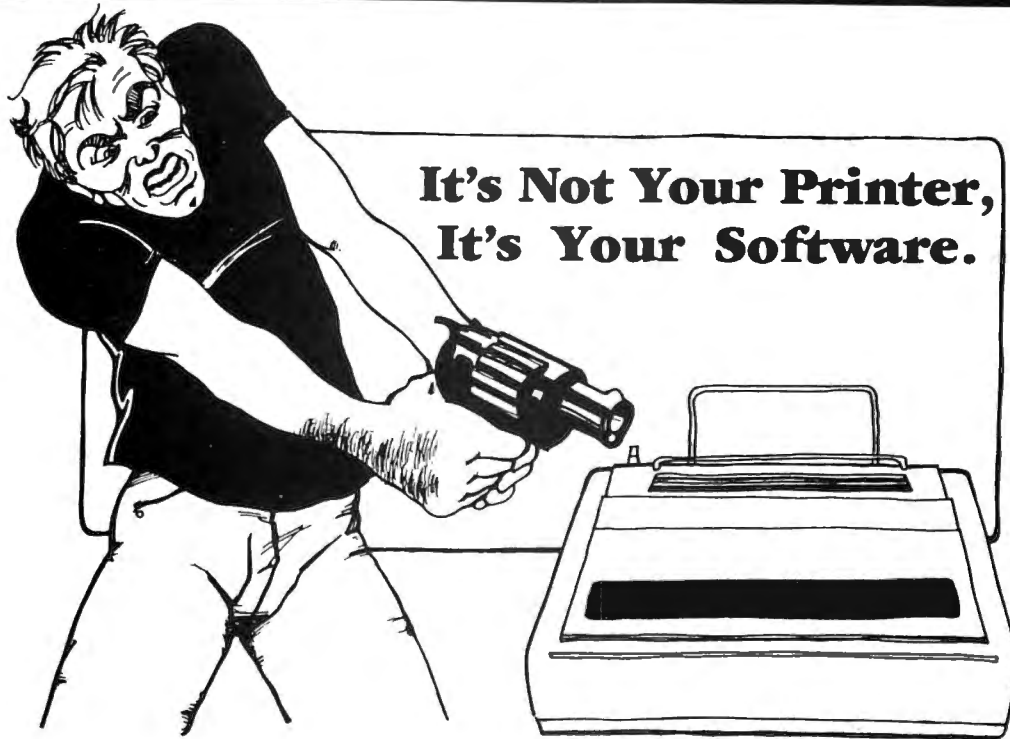
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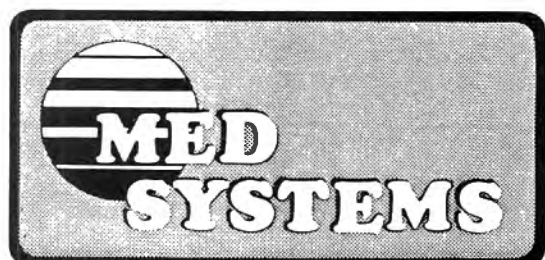
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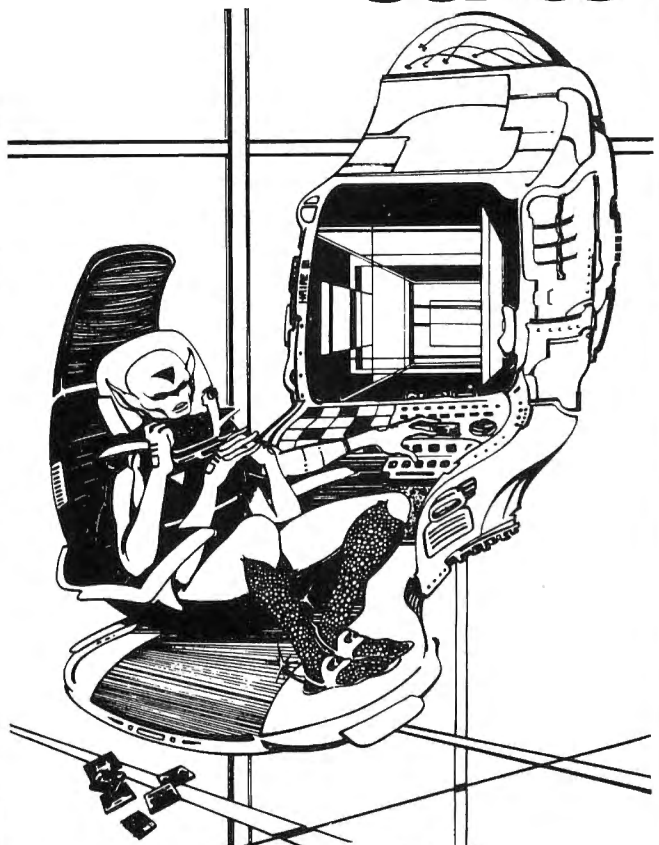
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You use them in prose, so use them in code.

In Praise of Outlines

Dennis Drew
908 Byers
Joplin, Missouri 64801

I teach programming classes using the TRS-80, and there is something I notice about all new programmers: they do things

the hard way. For example, if I ask them to explain the following lines: INPUT "ENTER YOUR NAME ":A\$. The explanation will sound like: "This line assigns a literal value into the string variable A\$ using input from the keyboard."

What's wrong with saying, "It lets you enter your name into the computer." The use of "twelve large words when one small one will do" is not confined to newcomers

either. I consider myself a fair programmer, yet I have to sweat through many articles I read in computer magazines.

A Question of Difficulty

How hard is it to write a program? In my early programming days I wrote a game called PHASE VII (available from Cheshire Software, P.O. Box 1295, Joplin, MO 64802). It was a difficult job and, because I knew nothing about program preparation, it took two years to write the game. It should have taken two or three months; but I had to restart three times.

Imagine the following: You have worked several hours on a program. There are about thirty major routines, a hundred minor ones, dozens of variables and everything has to fit together just right. Your brain is weary. Suddenly, you cannot remember the purpose of a certain variable. Now you have big trouble. Like a line of dominoes, the program starts falling, and you can do nothing to stop it. *Crash!* What a mess!

A Writer Doesn't Just Write

When a professional writer begins a novel he starts with a theme, which he writes down, putting the general plot on paper. After this, he writes an outline, a simple explanation of the story, piece by piece. He then writes a rough draft which follows the outline closely. Once the rough draft is finished, he re-reads to correct and revise. Using this rough draft, he writes the finished version. Then he lets a reliable friend read it and comment on it before showing it to anyone else. To do otherwise would be suicide in the writing market.

A Programmer Doesn't Just Code

Coding is actually writing the program in

STRING VARIABLES:

Variable name/purpose	Location (lines)
A\$ Holds list data	10,50,1100-1500, 2040,2060,2080, 2100,2120,3010- 3030,4030-4050, 5010,6020,6040- 6080
B\$ Decision	20,30,2010- 2120,4010
C\$ Small Sort marker	6010,6020
D\$ Sort saver	6040-6080

NUMERIC VARIABLES:

A For/next counter	4050,2020,3000, 4000,5000,5020, 6020
B,C,D Tape counters	40,50,5000,5010
E Choice	60-80
F Number of items	40,100,1100- 1150,2020,3000, 4000,5000,6020, 6090
G For . . . Next counter	4060
H Sort marker	6020
I Sort marker	6020,6040-6100

Program Variables

*"I consider myself a fair programmer,
yet I have to sweat through many articles
I read in computer magazines."*

computer language. If a programmer tries to write a program starting with coding he will die a slow, painful death, with bytes all over his body (sorry).

There is a set of easy-to-follow steps that I always use:

1. Define the task
2. Outline the procedure
3. Code
4. Enter
5. Run
6. Debug
7. GOTO 5

These steps can save hours of programming time and effort. Let's look at each step individually, while writing a small sample program. Then we will apply the principles to a larger program.

Define the Task

Write a mailing list program which accepts 100 names and addresses of three lines each, allows corrections, prints addresses on envelopes, prints names on the screen, stores names on tape, retrieves names from tape and sorts by zip codes (we use third class mail).

Outline the Procedure

There are different ways to outline pro-

cedure. Some folks diagram with flowcharts, drawings of computer programs. Flowcharts have their use, but I never flowchart. Why? Because in my mind it is too close to coding, and is no substitute for outlining. Let me give an example by writing a standard flowchart for the definition (see Fig. 1).

That flowchart is not simple. I use another method that fits my natural work-saving (lazy) attitudes. I outline in simple English.

If you can't explain a program in simple English, you sure can't write it in Basic. Your mother taught you English when you were a child; you should know the language far better than Basic. Use the power of your native language. This is my outline of the task:

1. Start with a zero.
2. Add five if the number is less than 100.
3. If the number equals 100 end the program.
4. Print the number and its square root in columns.
5. Return to step two.

The outline is easier to understand and faster to write than a flowchart.

Code the Program

Of course, to get the program to work on the computer, it has to be entered in Basic. Let's code it now following the outline:

- Start with zero.

10 X = 0 (this line should be eliminated on the TRS-80.)

- Add five if the number is less than 100. If the number equals 100 end the program.

20 IF X < 100 X = X + 5 ELSE END

- Print the number and its square root in columns.

30 PRINT X, SQR(X),

- Continue.

40 GOTO 20

Of course you now Enter and Run the program. Despite having taken the correct steps so far, the whole thing is not worth a bit (sorry again) unless it's correct.

Debug

Too often we see programs laced with bugs; I am tired of entering 16K adventure and Star Trek games that don't work.

Debugging a program means correcting errors; It sometimes takes as much (if not more) time than writing the program in the first place. Do not run a program once and decide it works. I put all of my programs through *hours* of actual execution before I

```

10 CLS: CLEAR 10800: DIM A$(101,5)
20 INPUT "DO YOU WISH TO PULL DATA FROM TAPE "; B$
30 IF LEFT$(B$,1) = "N" GOTO 60
40 INPUT "PREPARE TAPE TO PLAY. PRESS ENTER. "; F:
INPUT #-1, F: FOR A=1 TO F STEP 4: PRINT A; B=A+1; C=A+2; D=A+3
50 INPUT #-1, A$(A,1), A$(A,2), A$(A,3), A$(A,4), A$(A,5),
A$(B,1), A$(B,2), A$(B,3), A$(B,4), A$(B,5), A$(C,1),
A$(C,2), A$(C,3), A$(C,4), A$(C,5), A$(D,1), A$(D,2),
A$(D,3), A$(D,4), A$(D,5): NEXT
60 CLS: PRINT "DO YOU WISH TO 1-ENTER 2-CHANGE 3-LIST 4-PRINT ENVELOPES 5-STORE 6-SORT "
70 INPUT E
80 IF E < 10 OR E > 6 THEN GOTO 60
90 ONE = GOTO 1000, 2000, 3000, 4000, 5000, 6000
1000 PRINT: F = F + 1: PRINT F
1100 INPUT "NAME "; A$(F,1)
1200 INPUT "ADD: "; A$(F,2)
1300 INPUT "CITY: "; A$(F,3)
1400 INPUT "STATE: "; A$(F,4)
1500 INPUT "ZIP: "; A$(F,5)
1600 GOTO 60
2000 PRINT: PRINT "WHICH NAME DO YOU WISH TO CHANGE?"
2010 INPUT B$
2020 FOR A=1 TO F: IF A$(A,1) = B$ THEN GOTO 2030 ELSE NEXT
2030 INPUT "NAME: "; B$
2040 IF B$ = "" THEN GOTO 2050 ELSE A$(A,1) = B$
2050 INPUT "ADD: "; B$
2060 IF B$ = "" THEN GOTO 2070 ELSE A$(A,2) = B$
2070 INPUT "CITY: "; B$
2080 IF B$ = "" THEN GOTO 2090 ELSE A$(A,3) = B$
2090 INPUT "STATE: "; B$
2100 IF B$ = "" THEN GOTO 2110 ELSE A$(A,4) = B$
2110 INPUT "ZIP: "; B$
2120 IF B$ = "" THEN GOTO 2130 ELSE A$(A,5) = B$
2130 GOTO 60
3000 CLS: FOR A=1 TO F: PRINT A
3010 PRINT A$(A,1)
3020 PRINT A$(A,2)
3030 PRINT A$(A,3); " "; A$(A,4); " "; A$(A,5)
3040 PRINT: NEXT: FOR A=1 TO 500: NEXT: GOTO 60
4000 CLS: FOR A=1 TO F
4010 INPUT "INSERT ENVELOPE. PRESS ENTER "; B$
4020 CLS: PRINT "PLEASE WAIT
4030 LPRINT A$(A,1)
4040 LPRINT A$(A,2)
4050 LPRINT A$(A,3); " "; A$(A,4); " "; A$(A,5)
4060 FOR G=1 TO 12: LPRINT " "; NEXT
4070 NEXT: GOTO 60
5000 CLS: PRINT "PREPARE TO RECORD. ENTER": INPUT A
PRINT #-1, F: FOR A=1 TO F STEP 4: B=A+1; C=A+2; D=A+3
5010 PRINT #-1, A$(A,1), A$(A,2), A$(A,3), A$(A,4), A$(A,5),
A$(B,1), A$(B,2), A$(B,3), A$(B,4), A$(B,5),
A$(C,1), A$(C,2), A$(C,3), A$(C,4), A$(C,5), A$(D,1),
A$(D,2), A$(D,3), A$(D,4), A$(D,5)
5020 PRINT A: NEXT
5030 GOTO 60
6000 CLS: PRINT "SORTING. PLEASE WAIT
6010 C$ = "99999"
6020 I = I + 1: FOR A=1 TO F: IF A$(A,5) < C$ THEN C$ = A$(A,5)
: H = A
6030 NEXT
6040 D$ = A$(I,1): A$(I,1) = A$(H,1): A$(H,1) = D$
6050 D$ = A$(I,2): A$(I,2) = A$(H,2): A$(H,2) = D$
6060 D$ = A$(I,3): A$(I,3) = A$(H,3): A$(H,3) = D$
6070 D$ = A$(I,4): A$(I,4) = A$(H,4): A$(H,4) = D$
6080 D$ = A$(I,5): A$(I,5) = A$(H,5): A$(H,5) = D$
6090 IF I = F + 1 THEN GOTO 60
6100 PRINT I: GOTO 6010

```

Program Listing 1.

COTTAGE SOFTWARE

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release them for publication. Your programs are no less important. Any child can write a program; a good programmer writes bug-free programs.

Outline the Procedure

1. Clear screen. Reserve string space (100 times 3 times 36 equals 10,800). Set dimensions (name, address, city, state, zip code times 100 plus 1 for extra element in For. . . Next loops equals 101 by 5).

2. Allow pulling of data from tape if desired.

Pull total number of names.

Loop through total number of names four at a time to save tape time.

3. Give program options: Clear screen; Correct or change; List on screen; Print envelopes; Store names on tape; Sort by zip; Go to the proper routine.

4. Entry routines: Add 1 to total number of names. Print total. Enter name. Enter address. Enter city, state, zip (in separate variables). Go to Item 3.

5. Change routine: Allow entry of name. Find correct name in list by using a comparing loop. Allow corrections. Go to item 3.

6. List routine: Loop 1 through the total number of names. Display name, address, city, state, zip. Print a blank line. Finish loop. Go to Item 3.

7. Print routine: Loop 1 through total number of names. Prompt to insert envelope. Print an envelope. Feed envelope to operator. Finish loop. Go to Item 3.

8. Store routine: Loop 1 through total number four at a time. Store four on tape. Finish loop. Go to Item 3.

9. Sort routine: Start main loop to go through number of names. Start minor loop 1 through number of names. Find smallest item in list. Exchange with item at top of list. Finish minor loop. Finish main loop. Go to item 3.

End of outline

Code: You can follow the program by comparing it to the outline (see Program Listing 1).

The last thing we need to cover is documentation. I do not use REM statements, because they take up computer space and slow down programs. For example, I clocked the following program at 10.82 seconds.

```
10 FOR X=1 TO 5000
20 NEXT X
```

After adding the following line: 15 REM the program took 14.68 seconds. A few REM statements outside of loops will not make a lot of difference, but REM statements also consume memory. If you write a program and run out of space the first thing you do is cut REM statements. Why put them there in the first place? RAM is valuable, so do not

clog it up with REM.

The solution is to use pencil and paper. On paper you have all the room for REM statements and variable notation you need. Do not skimp on documentation! This is very important if you expect to program in a professional manner. If you look at an undocumented program six months from now you probably will not understand it.

It is necessary to write down REM-type statements in a non-menu driven program to document programming routines. In the mailing list program, the menu in line 60 and 80 will serve this purpose.

This demonstrates the art of programming simply and effectively. If you follow the seven basic steps every time you write a program, you will save time and memory, and avoid extra unnecessary work. ■

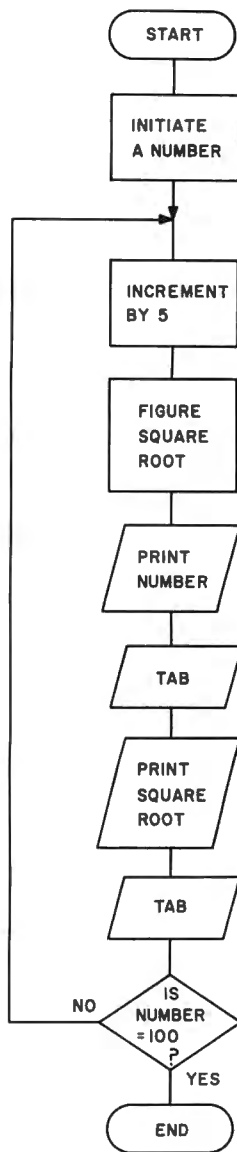


Fig. 1. Flowchart.

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There is a need for direct communication between personal computers and the real world. Without it the entry of sophisticated data is limited to input through a keyboard. This precludes real time applications, requires at least one additional level of abstraction, and introduces human error into a system.

The computer counts in whole numbers which change abruptly. Since the computer counts in jumps while the real world is continuous, converting one to the other means some small error must be tolerated (Fig. 1). Each increment of an eight-bit word is .4

percent of the full amount. That would be like measuring a foot and having a maximum error of less than 1/20 inch. If you need greater accuracy and you can cope with their complexity and cost, you can use a 10-bit (.1 percent) or 12-bit .025 percent) system. Most requirements are satisfied by an eight-bit system. Small errors like two plus two equals 3.984 are not a problem, but big errors can result if you assume a computer means 4.000000 when it shows you a 4.

Computer Talks to Real World

You need a means to convert the digital word into the power to drive a motor, vary an audio tone, or control a light source. A digital-to-analog converter can make that conversion. It can do it with either of two types of resistance networks (Fig. 2). With the supply voltages shown in Fig. 2, pegging the digital switches at the same settings in both systems will give identical current flow through the ammeter.

Converter Resistances

Binary-weighted resistances in a ratio of 2^n (1, 2, 4, 8, etc.) are connected as shown in Fig. 2a. In a four switch system 15 steps of 1/8 ampere from zero amperes to 15/8 amperes provide the 16 levels of a 4-bit system according to the closing of the appropriate switches.

This system found its widest use when complete digital-analog converters were not available on a chip. In this type of conversion, accuracy suffers if many bits are used. The range of resistor values in an eight-bit system would be from R to 256R. Resistor tolerances of .1 percent or better of non-standard higher values are required. It is difficult to maintain the system's linear properties after four or five bits because of its unpredictable drift with variations in temperature and other elements.

Climbing the R-2R-Ladder

Resistances R and 2R are connected as shown in Fig. 2b. With all switches grounded, the resistance from any node is 2R in any direction. Closing any switch divides the current at each node. Connecting S1—the farthest switch from the ammeter—to the minus 4V source makes the current through the ammeter 1/16 of the current through S1; connecting S4—the switch closest to the ammeter—makes the current through the ammeter 1/2 the current through S4. Thevenin's theorem or the principle of superposition will show the current flow through the ammeter is an analog equivalent of the digital value represented by the switch settings.

The major advantage of this system is the ease of fabricating extremely closely-matched resistances right on the chip with values of R. The requirement for twice the number of resistors is not a disadvantage considering microcircuit dimensions.

Affordable Chip

Current-to-voltage conversion is easily accomplished through the use of an operational amplifier. (Fig. 3.) By selecting the re-

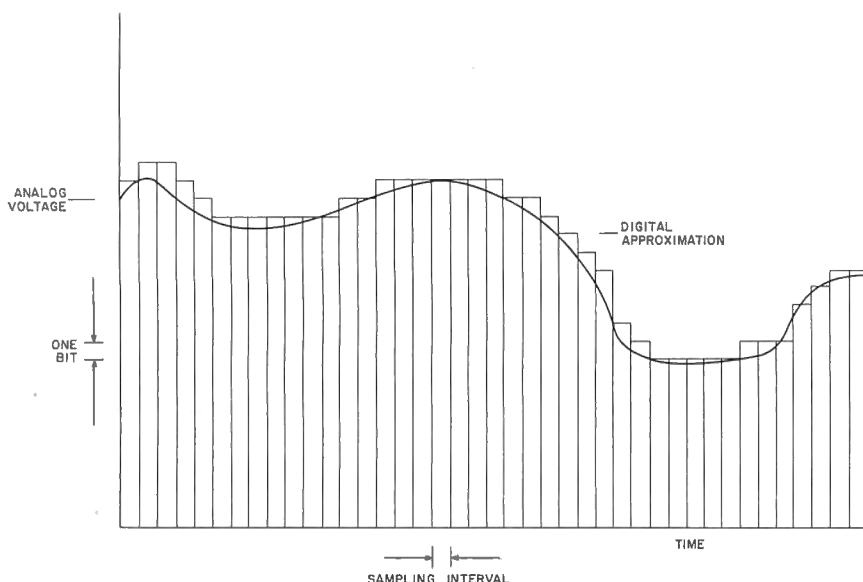


Fig. 1. Digitized Analog Signal.

"These transistors are inserted within the feedback loop to provide up to 75 mA..."

quired value for R_F we can achieve any desired multiplication. The mechanical switches may be replaced with FET switches accessed by the data bus.

A widely used integrated circuit, DAC-08, available from Precision Monolithics and National Semiconductor, provides R-2R capabilities on a single chip. Wide use has made the chip very affordable. A block diagram and an equivalent circuit of the DAC-08 are shown in Figs. 8a and b.

Inside the Beast

A schematic of the digital-to-analog section of the real world interface is shown in Fig. 4. A reference voltage (V_r) is generated across VR1 for use within the digital-analog integrated circuit. Maximum voltage output of the system is $255/256$ times V_{rRm}/R_f , available at pin six of 741 operational amplifier AR1. This voltage is used to drive transistors Q1 and Q2. Those transistors are inserted within the feedback loop to provide up to 75 mA output current from the digital-analog converter. This low impedance output voltage is returned to the negative input of AR1. This ensures that the output voltage will remain constant as long as the load does not draw more than 75 mA (the limit established by the 2W 220-ohm collector resistors).

Getting Your Feet Wet

To perform these experiments, all integrated circuits except IC7 must be installed. If IC7 is already installed it does not need to be removed. Both the plus five volt and the plus-minus 15 volt direct current supplies are also required.

Before attempting these experiments be sure to remove power from the TRS-80 and all power supplies. Never leave the power on while setting up or reconfiguring test hardware.

If the interconnect cable is not already installed between the TRS-80 and the real world interface connect the card-edge connector to the expansion port with the ribbon-cable exiting upward. Install the 40-pin DIP plug into SO1. Pin one of the 40-pin DIP plug goes to pin one of SO1.

Connect the plus five volt and the plus-minus 15 volt direct current supplies to the real world interface. Connect a direct current voltmeter capable of reading 15 volts across the digital-analog output and ground.

Turn on the plus five volt supply. All light emitting diodes (LEDs) should light. Turn on the plus-minus 15 volt supply. The voltmeter should indicate approximately 10.25 volts. Turn on the TRS-80.

A memory size start-up routine should occur. No memory need be reserved for these

experiments, so press Enter to get into Level II Basic.

Enter and run:

```
10 OUT 127,137 'Configures 8255
20 OUT 124,128 'Loads 80H into Port A
```

Enter and run:

```
10 OUT 127,137
20 OUT 124,064
30 OUT 124,128
40 GOTO 20
```

You should observe only the most-significant-bit (MSB) (left-most) LED lit. The meter should read exactly one-half the meter reading on power-up.

Run the program after changing line 20 to 20 OUT 124,64 'Loads 40H into Port A. You should observe only the second MSB LED lit. The meter should read exactly one-quarter of the meter reading on power-up.

You may want to try other values in line 20. Note that an error message occurs if a value outside the range of 0-255 is attempted, and quantities to the right of the decimal point are ignored.

You should observe the two MSB LEDs appear lit while the meter reads somewhere between one-quarter and one-half of the meter reading on power-up. The system is switching between the two voltages too fast for the meter or eye to follow it.

Run the program after adding 25 FOR P = 1 TO 100:NEXT P and 35 FOR P = 1 TO 100:NEXT P. Now the LEDs toggle visibly and the meter needle swings between the two values.

Change lines 25 and 35 to 25 FOR P = 1 TO 10:NEXT P and 35 FOR P = 1 TO 10:NEXT P and run the program. The LEDs will toggle rapidly while the meter needle

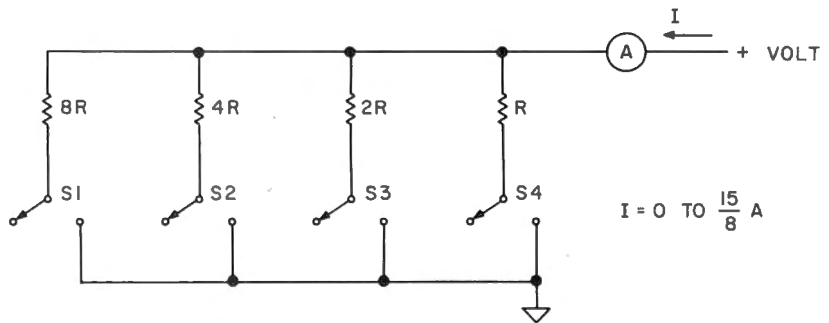


Fig. 2a. Binary weighted D/A converter.

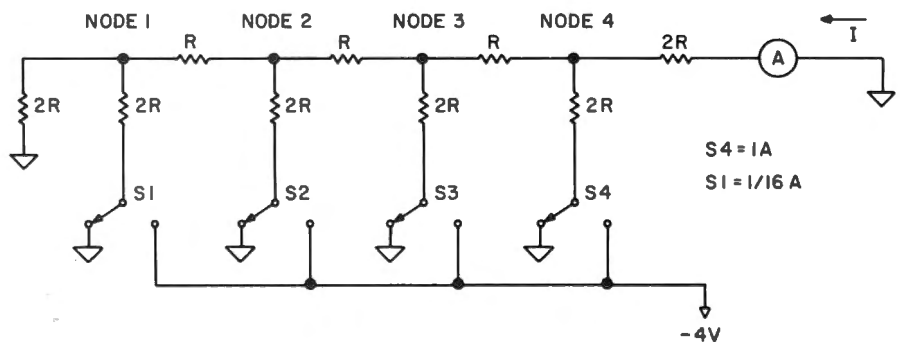


Fig. 2b. R, 2R Ladder D/A converter.

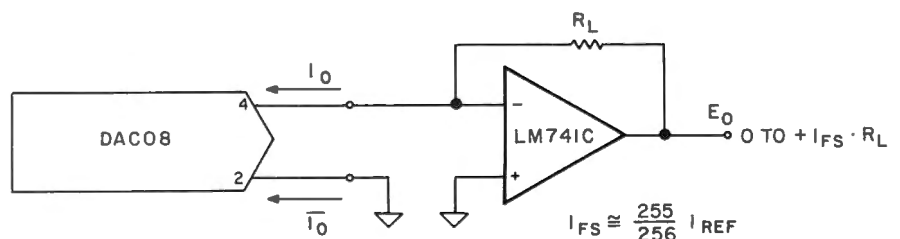
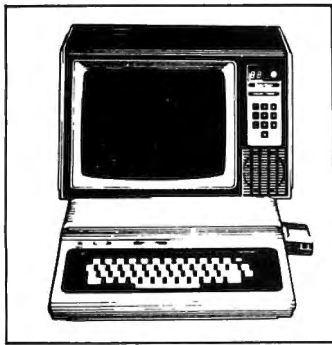


Fig. 3. Positive Low-Impedance Output Operation

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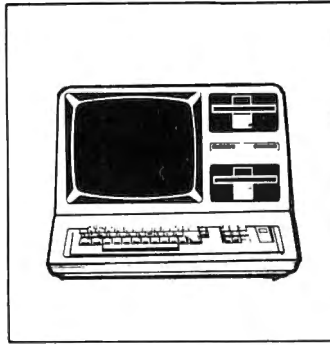
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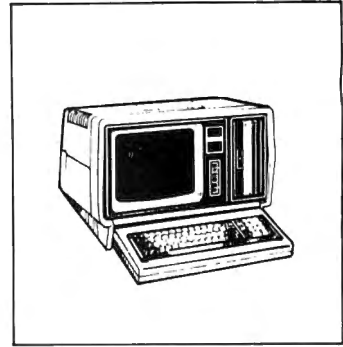
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dithers between the limits of its earlier swings. An oscilloscope can be connected to the digital-analog output terminals for a more informative examination of the various signals developed.

Next enter and Run100:

```
100 OUT 127,137
110 FOR N = 1 TO 255
120 OUT 124,N
```

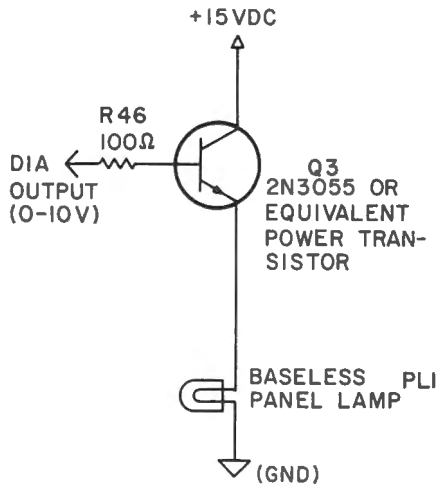


Fig. 5. Lamp Driver Circuitry.

```
130 NEXT N
140 GOTO 110
```

You should observe the LEDs continuously counting from 0-255. The meter swings from zero to maximum in about two seconds and quickly returns to zero at the end of each count. An oscilloscope will show a staircase-sawtooth waveform.

Change line 140 and add the lines:

```
140 FOR N = 255 TO 0 STEP -1
150 OUT 124, N
160 NEXT N
170 GOTO 110
```

Run the program again. Now the voltmeter swings from zero to maximum and back to zero, describing a triangular waveform.

Add 125 FOR P = 1 TO 10:NEXT P and 155 FOR P = 1 TO 10:NEXT P and Run100 the program. Now the ramp may be more closely studied.

Enter and Run200:

```
200 OUT 127,137
210 INPUT "ENTER DECIMAL NUMBER 0-255";M
220 IF M<0 OR M>255 GOTO 210
230 OUT 124, M
240 GOTO 210
```

The voltmeter will indicate a voltage pro-

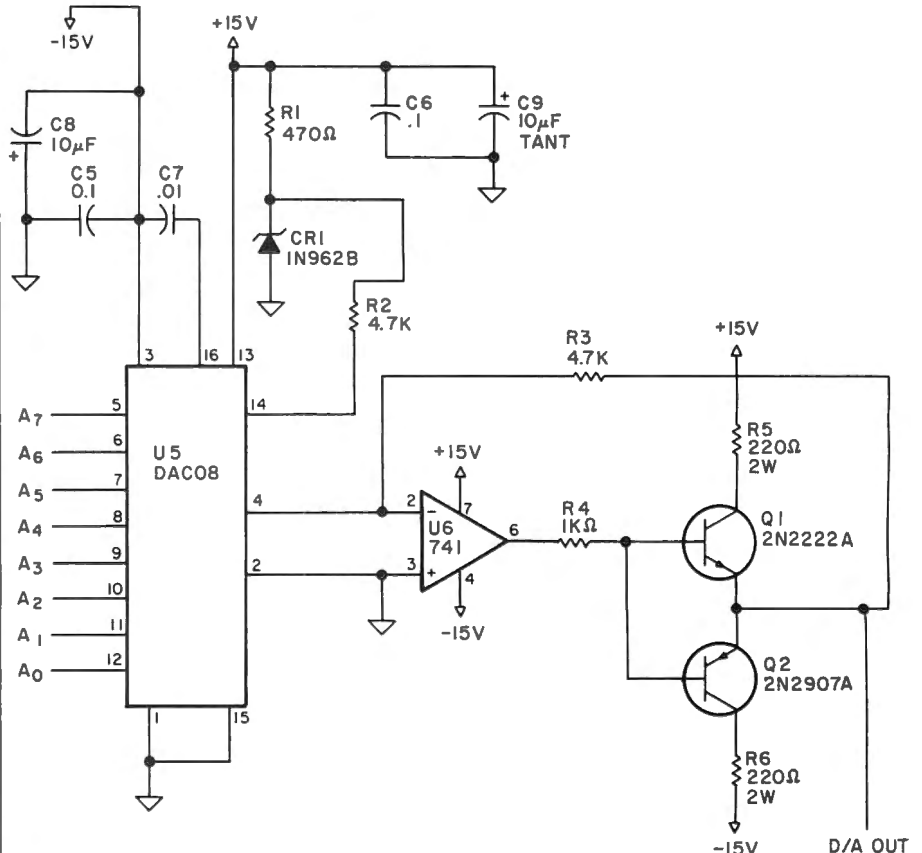


Fig. 4. Digital-to-Analog Converter.



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the heat-sink will
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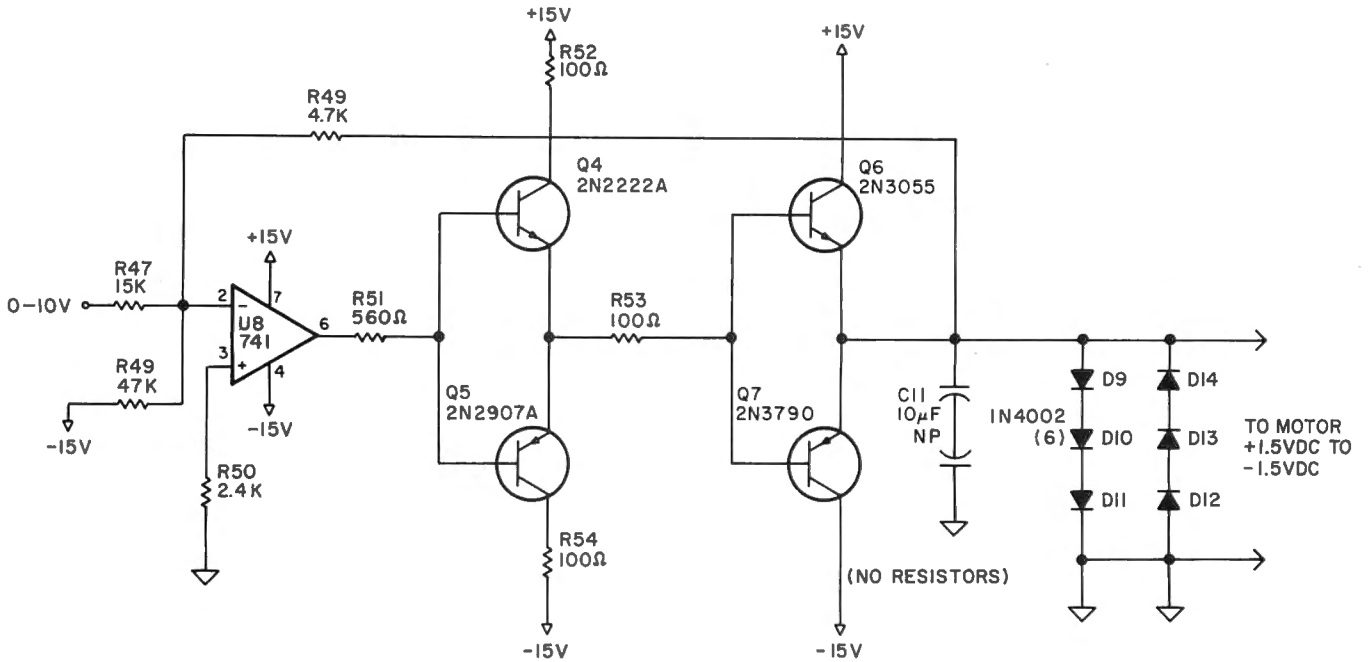


Fig. 6. Bi-directional, Variable-Speed, Permanent-Magnet Motor Driver.

portional to the decimal input (10X/255 volts). The LEDs will indicate the binary equivalent of the decimal input. Both the voltmeter reading and the LEDs still only indicate an abstraction of a physical condition and have no real meaning to the physical world.

The Reality Connection

Connect the lamp driver circuit (Fig. 5) to the output of the digital-analog converter. Use a 2N3055 NPN power transistor or equivalent with a heat-sink. Be sure to apply some silicone grease between the transistor and heat-sink to maximize the transfer of heat and put an insulating spacer between them. Without the spacer

the heat-sink will be at the same voltage as the transistor collector. Avoid inadvertent contact with other circuitry.

This circuit provides adequate current to power a small panel lamp. A baseless 12-volt bulb, like the kind used in automobile instrument panels, is convenient to use with clip leads, or inserted directly into a solderless breadboard or the space provided on the printed circuit board, avoiding the requirement for sockets and other items.

Run all the programs I've described with the panel lamp circuitry and the meter across the digital-analog output. Program operation will control the light bulb's brilliance. Note the voltmeter indicates

several volts above zero before the lamp glows.

The 0-10 volt direct current output from the digital-analog converter can be translated into a proportional voltage of about minus 1.5 vdc-plus 1.5 vdc (see Fig. 6).

Operational amplifier U8 sums the minus 15 vdc and the 0-10 vdc inputs. With the values shown in Fig. 6, an output of minus 1.5-1.5 vdc results from converter output voltages of 0-10 vdc. Transistors Q4-Q7 increase the circuit current-driving capability from a few mA from U8 to one Ampere.

Connect the motor-driver to the appropriate power supplies. Do not connect the permanent-magnet motor to the motor-driver output circuitry yet.

Type and enter: OUT 127,137: OUT124,128. This sets the motor-drive output to zero volts. Now connect the permanent-magnet motor to the motor drive output circuitry.

This motor is a 1.5 volt direct current motor used in small tape-recorders and battery-operated toys. (Radio Shack #273-208 or equivalent.) Clamp the motor in a small vise to prevent it from jumping around.

Run200 the program previously loaded. For numbers lower than 105 rotation of the motor shaft will be in one direction. Speed of rotation will increase as the numbers approach zero. For numbers higher than 150 rotation of the motor shaft will be in the opposite direction, increasing as the number approaches 255. Painting a spiral on the motor shaft with nail polish or white correction fluid makes the direction of rotation of the shaft more visible.

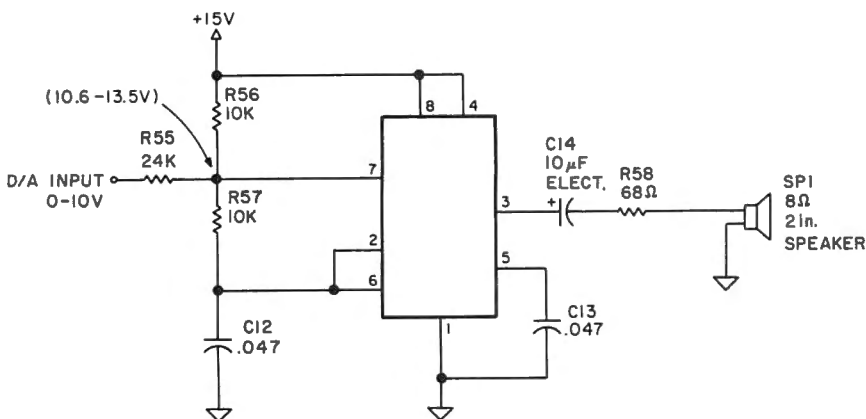


Fig. 7. Voltage-Controlled Audio Oscillator.

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"The computer can also convert analog signals into audio tones."

Enter 128 in response to the program prompt to stop the permanent-magnet motor, then Enter and Run300:

```

300 OUT 127,137:OUT 124,128: FOR N = 128 TO 0
  STEP - 1:OUT 124, N:NEXT N
310 FOR N = 0 TO 255
320 OUT 124, N
330 FOR M = 1 TO 10:NEXT M
340 NEXT N
350 FOR N = 255 TO 0 STEP - 1
360 OUT 124, N
370 FOR M = 1 TO 10:NEXT M
380 NEXT N
390 GOTO 310
  
```

The permanent-magnet motor gradually increases its speed in one direction, then slows to a stop, reverses direction, and gradually increases to maximum speed in

the opposite direction. You may want to increase or decrease the delay loops in line 330 and 370.

When the motor is stopped, depress Break, enter and Run400:

```

400 OUT 127,137:OUT 124,128
410 FOR N = 1 TO 500:NEXT N
420 OUT 124,105
430 FOR N = 1 TO 500:NEXT N
440 OUT 124,70
450 FOR N = 1 TO 500:NEXT N
460 OUT 124,35
470 FOR N = 1 TO 500:NEXT N
480 OUT 124,0
490 FOR N = 1 TO 500:NEXT N
500 OUT 124,255
510 FOR N = 1 TO 500:NEXT N
520 OUT 124,220
530 FOR N = 1 TO 500:NEXT N
540 OUT 124,185
  
```

```

550 FOR N = 1 TO 500:NEXT N
560 OUT 124,150
570 GOTO 410
  
```

The permanent-magnet motor suddenly changes speed and direction at one-second intervals. Hold the motor in your hand. Notice that large speed changes or reversals cause the motor to torque (twist) opposite to the shaft rotation. These speed and direction changes are sudden but not instantaneous.

The computer can also convert analog signals into audio tones (see Fig. 7). A number of schemes have been devised to produce musical or audio tones from the TRS-80, using the system as a very expensive square-wave generator. The major disadvantage with internally generated audio is it ties up the whole system which could be doing other things.

This is an example when the hardware/software trade-off—always an engineering consideration—favors hardware.

For our application, the integrated circuit for the 555 timer is configured as a voltage-to-frequency converter. Varying the input to R55 (24K) to between zero and 10 volts direct current results in the charging voltage—appearing at the junction of R55 (24K), R56 (10K), and R57 (10K)—varying between 10.6 volts and 13.5 volts dc. To allow the 555 to function as an oscillator, C_1 must charge to $2/3$ of V_{CC} (10 volts). This requirement is met with the value given for R55 (24K). Lowering the value of R55 to 20K causes the 555 to stop oscillating as the input to R55 approaches zero volts. This permits silencing the oscillator if desired.

Because of the capacitor involved, linear

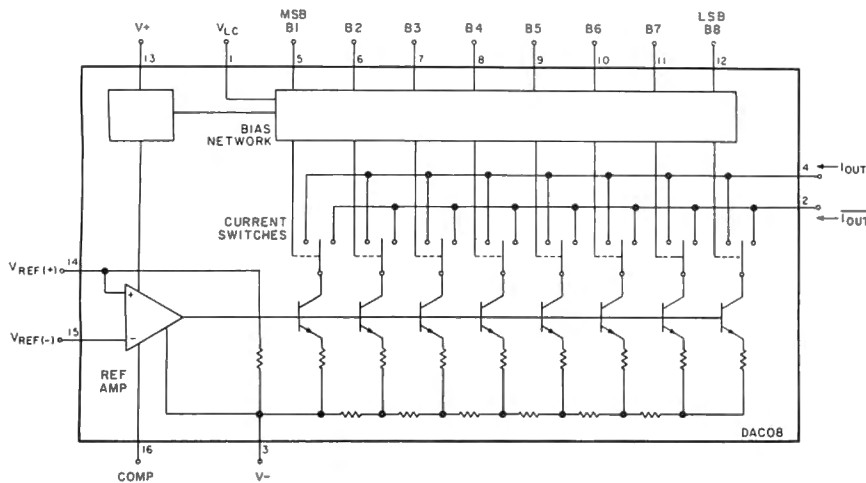


Fig. 8a. DAC-08 Block Diagram.

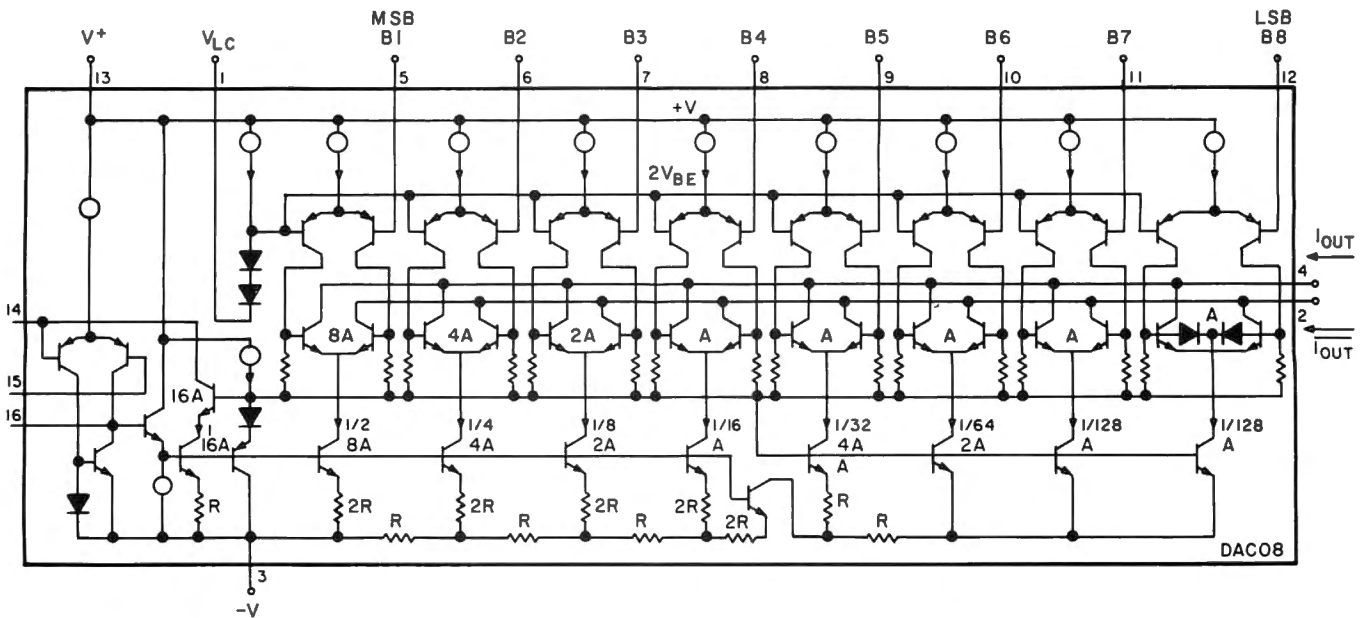


Fig. 8b. DAC-08 Equivalent Circuit.

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(straight-line) variations in voltage result in logarithmic changes in frequency. Happily the human ear and brain respond logarithmically to sound, and the result is surprisingly pleasant.

Next Run100 the program previously loaded. The light and motor may remain connected if desired.

You should hear a realistic siren sound from the loudspeaker.

Run200. For each number entered, a unique tone is heard.

Next, enter and Run600:

600 OUT 127,137
610 A = RND(256) - 1
620 OUT 124, A
630 GOTO 610

You should hear a jangled cacophony of tones. If the motor is connected, it will go bananas trying to follow the signal. The light will flash in disco style.

Enter and Run700:

700 OUT 127,137:CLS
710 A = RND(256) - 1
720 PRINT A;
730 OUT 124,A
740 FOR N = 1 TO 50:NEXT N
750 GOTO 710

Now the tones are distinct and separated. Some of you may be reminded of the music of J. S. Bach. The duration of each note is equal.

To vary the duration of each note enter and Run800:

800 OUT 127,137:CLS
810 A = RND(256) - 1
820 PRINT A;
830 OUT 124,A
840 B = RND(100) + 10
850 FOR N = 1 TO B:NEXT N
860 GOTO 810

The tones heard are reminiscent of bagpipes. You may want to experiment with additional program variations. For instance, a third random element may be introduced to control the number of times a note is repeated.

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Purpose: The purpose of TASMOM is to allow study, debugging, tracing and single-stepping of Z-80 object code. Special care has been taken to make the program easy to use by beginning Z-80 programmers. TASMOM was developed as a result of the author's dissatisfaction with the seven monitors he purchased. TASMOM has a 45+ page user manual documenting each of its features, and includes special user sessions which document the more complicated features.

"other excellent disassemblers are ... The Alternate Source's TASMOM, which provides symbols and disk files. (The TASMOM package is a powerful monitor, one of the best I've seen.)"
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- Files may be prepared off-line, taking advantage of your word processing program, or the included program "SAVE/CMD". Should a first attempt at transmission fail, your file is still safely on your disk & available for a second try.
- Transmit and receive files may be opened before communication begins, and may be turned on and off independently. In a specialized application, one file may be transmitted while a different file is simultaneously being received. Control codes may be used to allow the remote computer to control the file operations.
- A single line may be sent from the file, allowing sending from the file to be intermixed with typing from the keyboard. This allows a more flexible response to prompts from the remote computer, and permits transmitting data to a computer that cannot accept full speed transmission and does not use control codes to start and stop the file transmission.
- DOS commands and programs which execute in the lower 16K of memory may be executed while maintaining positions in the transmit and receive files. The previous screen contents are restored upon completion of the DOS command.

MODEM 80 is compatible with ALL popular operating systems including LDOS, Newdos/80 (even version 2.0), DOSPLUS, TRSDOS and ULTRADOS.

MODEM 80 requires one disk drive and 32K.
MODEM 80 is supplied on diskette with full-size punched manual.
MODEM 80 costs just \$39.95

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AT LAST !!

CONCINNATOR

The wait is over, Model III people!! Concinnator opens the door to machine language programming! Concinnator is a patch to Radio Shack's Editor Assembler 1.2 package -- patches it right up to work on YOUR system! Not only that, but Concinnator makes numerous improvements to the package; just look:

Improvements:

- You can reserve memory for machine language programs and dump the assembled code to this reserved area! Keeps Concinnator in memory, still intact so that you can return to it later!
- Concinnator allows you to execute the assembled code that you dumped into the reserved memory area! This means you can test your code and do your debugging, etc. without tons of tape I/O. When, and only when your program is complete -- then you can save your source/object code to tape! Toggle between assembled code and Concinnator at will!
- When it comes to tape I/O, Concinnator provides you with all of the ideal options: it honors the break key so you can escape from unwanted loads or saves; it features a verify option to ensure that your code was saved accurately; it also supports selectable baud rate (500 or 1500)!
- Concinnator is at your command -- ready at any time to convert, display and/or modify contents of memory locations!
- Concinnator keeps you informed of available memory by continually displaying the number of bytes remaining in the text buffer!
- Enter, at any time, BASIC's monitor mode (SYSTEM prompt) for jumps to any location in memory and/or to load SYSTEM tapes.
- Enter, at any time, BASIC's command mode (READY prompt) to perform any needed calculator functions.
- Concinnator even allows you to return to fully programmable BASIC, keeping Concinnator intact and waiting, and optionally, dumped machine programs and source code protected in high memory!

The best news is that Concinnator provides ALL of these options, and takes away less than 400 bytes from the original text buffer (when no memory is reserved)!! **Included with Concinnator** is a program called SYSTPE which allows you to combine EDTASM and Concinnator into one SYSTEM tape at high speed, for easy use. **A third bonus program**, CPYALL, allows you to read back object code produced by Concinnator, and resave it as a continuous (rather than segmented) high speed tape!

And it's just \$19.95!!

Concinnator requires Radio Shack's EDTASM 1.2 (Concinnator does NOT support disk I/O. sorry)

The Alternate Source is always accepting subscribers to their magazine. But they aren't always giving away free programs to subscribers. Just now and then. Before March 31, 1982 each person subscribing/renewing for a 24 issue period to TAS, and mentioning this advertisement, will receive absolutely free, a program called **FLY**. You will find this program to be literally **full of bugs** yet containing no errors. **Swarming** with action, it's sure to amuse you for hours on end. **FLY** is not for sale anywhere. It is available only through this and similar advertisements; offer good until March 31, 1982. Twenty four issues of TAS are \$36.00, **FLY** is free. You'll **swat** yourself if you miss this one!

An assembly time-cost analysis program with heart.

The Pacemaker

David Tinis
National Controls Inc.
4500 John Young Pkwy.
Orlando, FL 32804

A modern piece of electronic equipment consists of a multitude of parts. In fact, a printed circuit board assembly may include hundreds of resistors, capacitors, transistors, diodes and integrated circuits. Have you ever wondered how a finished assembly was created from a pile of parts?

It should be immediately obvious a worker does not sit down with all the components to build the finished product. Instead, assembly lines are created in which the product has parts added to it until a completed unit is produced.

Pacing a Line

This brings us to the concept of a "paced" assembly line. Imagine an assembly line consisting of four workstations whose purpose is to build a printed circuit assembly. A bare board enters the first station and has parts mounted on it. Then it's passed to the next three for additional parts, until the final assembly emerges at the last station. All seems to be working well. But suppose it takes the first station five minutes to complete the required task, the second three minutes, the third eight and the fourth four. Some workers will be sitting for long stretches with nothing to do while others must work feverishly to keep up.

Looking at the total time of our hypothetical four-station line, we find it should take 20 minutes of assembly time to build a single unit. But is that true?

Even though station two can finish its job in three minutes, it must wait two more minutes for the next piece from station one. Station three in turn requires eight minutes for its task. A backlog starts to

build as the two faster stations pass on more boards than it can handle. Station four, like station two, is limited by its preceding station. It can finish a job in four minutes, but must wait four more minutes for station three to finish.

This results in an assembly time of 26 minutes instead of 20 minutes and an efficiency of only 78 percent. The solution is to redistribute the work among the workstations so each will take equal time.

An actual production line will have these problems multiplied manyfold. How do you set up an efficient assembly line from scratch?

You could go on past experience or a "gut feeling" and later adjust the line as required. But this wastes time and manpower resources. Good practice dictates establishing standard times for every operation. Then, by adding all the standard times, a total time for the finished assembly can be established.

Working backward, you can divide the total time by the number of workstations to arrive at a time per work station. Knowing this, you can return to the per component standard times to determine what combinations of parts should be assigned to each work station. This step is usually the most difficult one, involving the manipulation of lots of numbers, and can turn into a major job when applied to an assembly with a large number of parts.

The Computer Steps In

Here is where an assembly time/cost analysis program is useful. Such a program allows the engineer to easily rearrange work station compositions until a balanced condition is achieved.

Assembly Time/Cost Analysis allows a person to create a paced assembly line with a minimum of aggravation. Through a master menu, the user can create new files or load saved files containing assembly/work station data. Parts can be changed, added, deleted or moved from one station

to another. Station composition can be viewed either for a single station or all stations sequentially. Each station may contain up to 20 discrete components, and the number of stations is limited only by your computer's memory size. Finally, cost per work station can be automatically computed, a necessary detail for a profit making business.

Glossary

The program is essentially self-prompting; however, a glossary of terms used as they are encountered in the program is included for maximum understanding.

- **Performance Factor**—This is an adjustable number used for uncontrollable variables—fatigue, housekeeping, personal needs, etc. It is generally between one and two although it could be higher for really inefficient operations.

- **To illustrate**, it may take 0.5 minutes to bend the leads on a resistor, insert it in a printed circuit board, solder it and clip the leads. Based on this standard time you might expect 120 resistors an hour to be handled. But try doing it yourself sometime; before long you get tired and bored. You stretch, go get a drink, go to the bathroom, talk to a fellow worker, etc. At the end of an hour you may have done only 100 resistors. To allow for this, an adjustment is made to the standard time.

- **Raw Minutes**—This is the ideal time to perform the required operations for a single part. When displayed in the station breakdown, this will be multiplied by the quantity of the particular part.

- **Factored Minutes**—This is the adjusted allowable time for installation of a line item. This number represents Raw Minutes times Quantity times Performance Factor.

- **Factored Hours**—The adjusted allowable time for a line item converted to hours or fractions of hours.

- **Direct Labor Hourly Rate**—The average hourly wage paid to a direct labor

“Have you ever wondered how a finished assembly was created from a pile of parts?”

worker—those individuals who actually build the product.

- **Overhead Percentage**—A factor used to add in the cost of doing business other than raw materials and direct labor. This includes rental of facilities, maintenance, management salaries, office workers, utilities, etc. It even extends to the cost of the company's softball team, company picnic and greens fees for the golf league. Anything that costs money adds to the expense of operation and is included in overhead.

Initial entry into the program results in a two choice mini-menu. A new file can be created or an old one recalled. Entering a new file entails inserting file name, performance factor and number of assembly line stations information. If you are unsure about the actual number of stations needed, it causes no harm to specify some extras and then leave them blank. The array scanner used by various parts of the program detects these empty stations and notifies you of their availability. When reading in an old file you don't get initialization prompts since the required data is stored as part of the file.

Both selections eventually get you to the Main Menu. This gives you 10 commands plus an exit from the program:

- **Totals By Station**—Use this command to view a work station component breakdown. Either a single station or all stations in sequence can be viewed. Output can be either video or printer.

- **Factored Hours By Station**—This is a summary of all stations, used as a quick check to see how well the line balancing is proceeding. Output can be to either video or printer.

- **Reassign Parts**—Parts can be moved from one station to another. Requests for movement to or from nonexistent stations or to full stations are trapped and rejected.

- **Enter Additional Parts**—This is a two-part routine. Parts can be added to an existing station if it is not full or an empty station can be assigned a parts group. The parts entry portion requires a yes/no after each part is entered. The station entry portion uses the “easy entry” mode first used when creating a new file.

- **Delete Parts**—As the command states, you tell it what item at what station to delete and it does. First, however, it displays the item and part numbers and asks for confirmation to delete it.

- **Assembly Costs**—The Direct Labor Hourly Rate and Overhead Percentage are

entered and a cost per station and total cost are calculated. Output can be video or printer.

- **Save Current File**—Saves the work station file on disk.

- **Restart**—Provides a clean way to finish operations on one file and start on a different one.

- **Change Performance Factor**—Allows instant changes to be made to the factored calculations.

- **Edit Current File—Single line items** can be changed. A small menu allows selection of specifications to change.

Line List

I tried to write the program in a modular fashion so it could be modified or expanded as the need arose. With that in mind, I've provided a line number list:

- **Lines 10-90:** Initialization. The user has the option of opening a new file or

retrieving an old one.

- **Lines 100-110:** Main menu.

- **Lines 990-1999:** Work station composition breakdown by single station or all stations.

- **Lines 2000-2999:** Factored hours per work station and total for all stations.

- **Lines 3000-3999:** Parts transfer from one station to another.

- **Lines 4000-4999:** Addition of parts to a station.

- **Lines 5000-5999:** Deletion of parts from a station.

- **Lines 6000-6999:** Cost analysis by work station and total for all stations.

- **Lines 7000-7999:** Menu driven editor.

- **Lines 8000-8999:** Saves the current file to disk.

- **Lines 9000-9999:** Loads a requested file from disk.

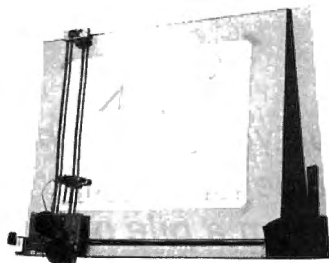
- **Lines 10000-14040:** Various sub-routines. ■

Program Listing

```
10 CLS: CLEAR 1500: P$="###.####|": C$="$$$###.###"
15 PRINT CHR$(23): PRINT@120, "ASSEMBLY TIME/COST ANALYSIS": FOR X=1
TO 300: NEXT
16 PRINT@262, "(1) CREATE NEW FILE"
17 PRINT@326, "(2) LOAD EXISTING FILE"
18 PRINT@390, "": INPUT A
19 IF A<1 OR A>2 THEN 16 ELSE IF A=2 THEN 9000
20 INPUT "ASSEMBLY (FILE) NAME ", F$
25 INPUT "PERFORMANCE FACTOR ", PF$
30 INPUT "NUMBER OF WORKSTATIONS ", NS
40 GOSUB 14000
50 JO=0: FOR X=1 TO NS
55 CLS: S=1: PRINT "STATION NUMBER: "; X: PRINT "ENTRY IN ITEM FIELD:
'0' ENDS STATION ENTRY, '/' ENDS ALL ENTRY"
60 PRINT@25, "PARTS THIS STATION: "; S: PRINT@192, "ITEM NUMBER:
": PRINT@320, "PART NUMBER
": PRINT@440, "QUANTITY: "; S: PRINT@576, "RAW MINUTES FOR S
INGLE ITEM: "; S
70 PRINT@205, "": INPUT X$: IF X$="0" THEN 90 ELSE IF X$="/" THEN 100 ELSE
IN(X,S)=VAL(X$): PRINT@333, "": INPUT P$(X,S): PRINT@458, "": INPUT
QT(X,S): PRINT@606, "": INPUT RM(X,S)
75 PS(X)=S
80 RM(X,S)=RM(X,S)*QT(X,S): FM(X,S)=RM(X,S)*PF: FH$(X,S)=FM(X,S)/6
0: S=S+1: IF S>20 THEN CLS: PRINT "NO FURTHER ITEMS ALLOWED FOR THIS ST
ATION": FOR A=1 TO 500: NEXT A: CLS: GOTO 900 ELSE GOTO 60
90 IF JO=1 THEN 4170 ELSE NEXT X
100 CLS: PRINT TAB(15); "ENTER OPTION DESIRED": PRINT TAB(15); "(1) TO
TALS BY STATION": PRINT TAB(15); "(2) FACTORED HOURS BY STATION": PR
INT TAB(15); "(3) REASSIGN PARTS": PRINT TAB(15); "(4) ENTER ADDITION
AL PARTS": PRINT TAB(15); "(5) DELETE PARTS"
105 PRINT TAB(15); "(6) ASSEMBLY COSTS": PRINT TAB(15); "(7) SAVE CUR
RENT FILE": PRINT TAB(15); "(8) RESTART": PRINT TAB(15); "(9) CHANGE P
ERFORMANCE FACTOR": PRINT TAB(15); "(10) EDIT CURRENT FILE": PRINT TA
B(15); "(11) END JOB": PRINT TAB(15); "": INPUT O
110 IF O<1 OR O>11 THEN 100 ELSE ON O GOTO 900, 2000, 3000, 4000, 50
00, 6000, 8000, 10, 13000, 7000, 10000
900 CLS: INPUT "(1) ALL STATIONS OR (2) SINGLE STATION "; A: IF A<1
OR A>2 THEN 900
1000 OS=0: INPUT "(S) SCREEN OR (P) PRINTER "; A$: IF A$="P" THEN OS=1:
GOSUB 13000
1001 IF A=2 AND OS=0 INPUT "WHICH STATION "; X: GOSUB 1010: GOTO 1999
1002 IF A=2 AND OS=1 INPUT "WHICH STATION "; X: GOSUB 1070: GOTO 1999
1003 IF A=1 AND OS=0 GOTO 1005
1004 IF A=1 AND OS=1 GOTO 1006
1005 FOR X=1 TO NS: CLS: GOSUB 1010: NEXT X: GOTO 1999
1010 S=1: TF$(X)=0: CLS
1020 PRINT "STATION NUMBER: "; X: PRINT "ITEM # PART # QUAN.
RAW MIN. FACT. MIN. FACT. HRS.": PRINT
1030 IF S=20 THEN 1050 ELSE IF IN(X,S)=0 THEN 1050 ELSE PRINT TAB(2); IN(X,
S); PRINT TAB(9); P$(X,S); PRINT TAB(23); QT(X,S); PRINT TAB(31); "":
PRINT USING P$; RM(X,S); PRINT TAB(42); "": PRINT USING P$; FM(X,S);
PRINT TAB(53); "": FH$(X,S)=FM(X,S)/60: PRINT USING P$; FH$(X,S)
1035 TF$(X)=TF$(X)+FH$(X,S)
```

Program continues

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Program continued

```

1040 IFS=10THENPRINT:INPUT"PRESS <ENTER> FOR MORE";A$:CLS:S=S+1:
GOTO1020:ELSES=S+1:GOTO1030
1050 PRINT:PRINTTAB(16);"TOTAL FACTORED HOURS FOR STATION";X;":
";:PRINTUSING P$;TF$(X):PRINT:INPUT"PRESS <ENTER> TO CONTINUE";A
$:RETURN
1060 LPRINT CHR$(14);:LPRINTTAB(10);"ASSEMBLY:";F$:LPRINT:LPRINT
TAB(18);"PERFORMANCE FACTOR:";PF:LPRINT CHR$(13);:FOR X=1TONS:GOS
UB1070:NEXTX:GOTO1999
1080 LPRINT"ITEM #      PART #      QUAN.  RAW MIN.  FACT. MIN.
FACT. HRS.":LPRINT CHR$(13)
1090 IFS>20THEN110ELSEIFIN(X,S)=0THEN1110ELSELPRINTTAB(2);IN(X,
S);:LPRINTTAB(9);PNS(X,S);:LPRINTTAB(23);QT(X,S);:LPRINTTAB(31);"
";:LPRINTUSING P$;RM(X,S);:LPRINTTAB(42);":":LPRINTUSING P$;PM(
X,S);:LPRINTTAB(53);":":FH$(X,S)=PM(X,S)/60:LPRINTUSING P$;FH$(X
,S
1100 TF$(X)=TF$(X)+FH$(X,S):S=S+1:GOTO1090
1110 LPRINT CHR$(13):LPRINTTAB(16);"TOTAL FACTORED HOURS FOR STA
TION";X;":":":LPRINTUSING P$;TF$(X):FORZ=1TO2:LPRINT CHR$(13)
NEXTZ:RETURN
1999 GOTO100
2000 OS=0:AS#=0:CLS:INPUT"(S) SCREEN OR (P) PRINTER ";A$:IFAS#="P
"THEN OS=1:GOSUB13000
2010 HD$="STATION NUMBER      FACTORED HOURS":IF OS=1 THEN L
PRINT"FACTORED HOURS BY STATION":LPRINT:LPRINT HD$ ELSE CLS:PRIN
T HD$
2020 FOR X=1TONS
2030 S=1:TF$(X)=0
2040 IFS>20THEN2050ELSEIF IN(X,S)=0THEN 2050 ELSE TF$(X)=TF$(X)+
FH$(X,S):S=S+1:GOTO2040
2050 AS#=AS#+TF$(X):IF OS=1 THEN LPRINTTAB(6);X;:LPRINTTAB(27);"
";:LPRINTUSING P$;TF$(X) ELSE PRINTTAB(6);X;:PRINTTAB(27);":":PR
INTUSING P$;TF$(X)
2055 IF OS=0 AND X/10=INT(X/10) THEN INPUT"PRESS <ENTER> TO CONT
INUE";A$:CLS:PRINT HD$
2060 NEXT X
2070 H2$="TOTAL FACTORED HOURS FOR ALL STATIONS: ";IF OS=1 THEN
LPRINT H2$;:LPRINTUSING P$;AS#;LPRINT:LPRINT: ELSE PRINT H2$;:PR
INTUSING P$;AS#
2998 INPUT"PRESS <ENTER> TO CONTINUE";A$
2999 GOTO100
3000 IFNS=1THENPRINT"ONLY ONE STATION. UNABLE TO TRANSFER PARTS.
":GOTO3999ELSECLS:INPUT"REMOVE PART FROM WHICH STATION ";RS:IFRS
<1 OR RS>NS THEN3000
3010 PRINT@128,"";:INPUT"ADD PART TO WHICH STATION ";DS:IFDS<1 O
R DS>NS OR DS=RS THEN3010
3020 INPUT"ENTER ITEM NUMBER ";PA
3030 S=1
3040 IF IN(RS,S)=PA THEN3060ELSEIF IN(RS,S)=0 OR S=20 THEN3050EEL
SE S=S+1:GOTO3040
3050 PRINT"ITEM ";PA;" NOT FOUND.":GOTO3998
3060 PRINT"ITEM ";IN(RS,S);" PART NUMBER ";PNS(RS,S)
3070 INPUT"IS THIS THE ITEM TO BE MOVED (Y/N) ";A$:IFAS#<"Y"THEN
3998
3080 D=1
3090 IFD>20PRINT"DESTINATION STATION FULL.":GOTO3998
3100 IF IN(DS,D)<0THEN D=D+1:GOTO3090
3110 IN(DS,D)=IN(RS,S):PNS(DS,D)=PNS(RS,S):QT(DS,D)=QT(RS,S):RM(
3113 PS(DS)=D:P$(RS)=PS(RS)-1
DS,D)=RM(RS,S):FM(DS,D)=FM(RS,S):PH$(DS,D)=PH$(RS,S)
3115 GOSUB3120:GOTO3998
3120 GOSUB13700:IFS=20THEN3150
3130 IN(RS,S)=IN(RS,S+1):PNS(RS,S)=PNS(RS,S+1):QT(RS,S)=QT(RS,S+
1):RM(RS,S)=RM(RS,S+1):FM(RS,S)=FM(RS,S+1):PH$(RS,S)=PH$(RS,S+1)
3140 S=S+1:IFS=20THEN3150ELSE3130
3150 IN(RS,S)=0:PNS(RS,S)="":QT(RS,S)=0:RM(RS,S)=0:FM(RS,S)=0:F
H$(RS,S)=0:RETURN
3998 GOSUB11000
3999 GOTO100
4000 CLS:INPUT"(1) ADD PARTS OR (2) ADD STATION";A
4001 IF A<1 OR A>2 THEN4000ELSEIF A=2 THEN4100
4002 INPUT"ADD TO WHICH STATION ";DS
4005 IF DS<1 OR DS>NS THEN 4000
4010 D=1
4020 IF IN(DS,D)=0 THEN4030ELSEIF D=20 THENPRINT"STATION FULL":G
OTO4060:ELSE D=D+1:GOTO4020
4030 CLS:PRINT"STATION NUMBER ";DS;:PRINT@25,"PARTS THIS STATIO
N ";:D:PRINT:INPUT"ITEM NUMBER ";:IN(DS,D):PRINT:INPUT"PART NUM
BER ";:PNS(DS,D):PRINT:INPUT"QUANTITY ";:QT(DS,D):PRINT:INPUT"
RAW MINUTES ";:RM(DS,D)
4040 RM(DS,D)=RM(DS,D)*QT(DS,D):FM(DS,D)=RM(DS,D)*PF:FH$(DS,D)=F
M(DS,D)/60
4045 PS(DS)=D
4050 PRINT:D=D+1:IFD>20THENPRINT"THIS STATION NOW FULL":GOTO4060
:ELSE INPUT"ADD ANOTHER PART TO THIS STATION (Y/N)";A$:IFAS#="Y"
HEN CLS:GOTO4030
4060 INPUT"ADD PARTS TO ANOTHER STATION (Y/N)";A$:IFAS#="Y"THEN40
00ELSE4999
4100 ZS=0:GOSUB13500:PRINT"AVAILABLE EMPTY STATIONS:";
4110 FORX=1TONS:IFPS(X)=0PRINT"--";X;:ZS=1
4120 NEXTX
4130 IFZS=0THENPRINT"NONE";:PRINT:GOSUB11000:GOTO4999:ELSEPRINT
4150 INPUT"STATION NUMBER TO BE ADDED";A
4160 IF A<1 OR A>NSTHENPRINT"THAT STATION IS UNDEFINED":GOTO4150
:ELSEIFPS(A)<0THENPRINT"THAT STATION IS ALREADY IN USE":GOTO415
0ELSEX=A:JO=1:GOTO55
4170 CLS:INPUT"ANYTHING ELSE TO ADD (Y/N)";A$:IFAS#="Y"THEN4000E
LSE100
4999 GOTO100
5000 CLS:INPUT"DELETE FROM WHICH STATION ";RS
5005 IFRS<1 OR RS>NS THEN 5000
5010 PRINT:INPUT"DELETE ITEM NUMBER ";PA
5020 S=1
5030 IF IN(RS,S)=PA THEN5050ELSEIF IN(RS,S)=0 OR S=20 THEN5040EEL
SE S=S+1:GOTO5030
5040 PRINT"ITEM ";PA;" NOT FOUND.":GOTO5000
5050 PRINT"ITEM ";IN(RS,S);" PART NUMBER ";PNS(RS,S)
5060 INPUT"IS THIS THE ITEM TO BE DELETED (Y/N)";A$:IFAS#<"Y"THE
N5000
5070 GOSUB 3120
5075 PS(RS)=PS(RS)-1
5080 INPUT"DELETE ANOTHER PART FROM THIS STATION (Y/N)";A$:IFAS#
="Y"THENCLS:GOTO5010
5998 INPUT"DELETE A PART FROM ANOTHER STATION (Y/N)";A$:IFAS#="Y"
THEN5000

```

Program continues

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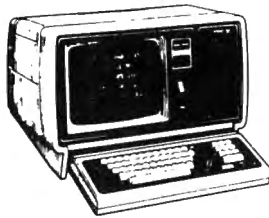
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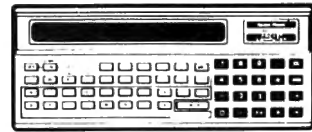
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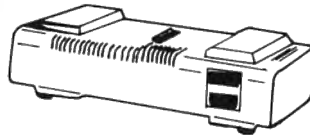
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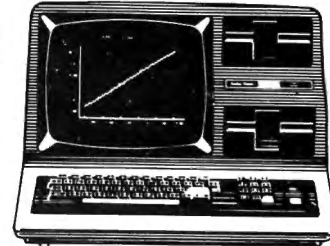
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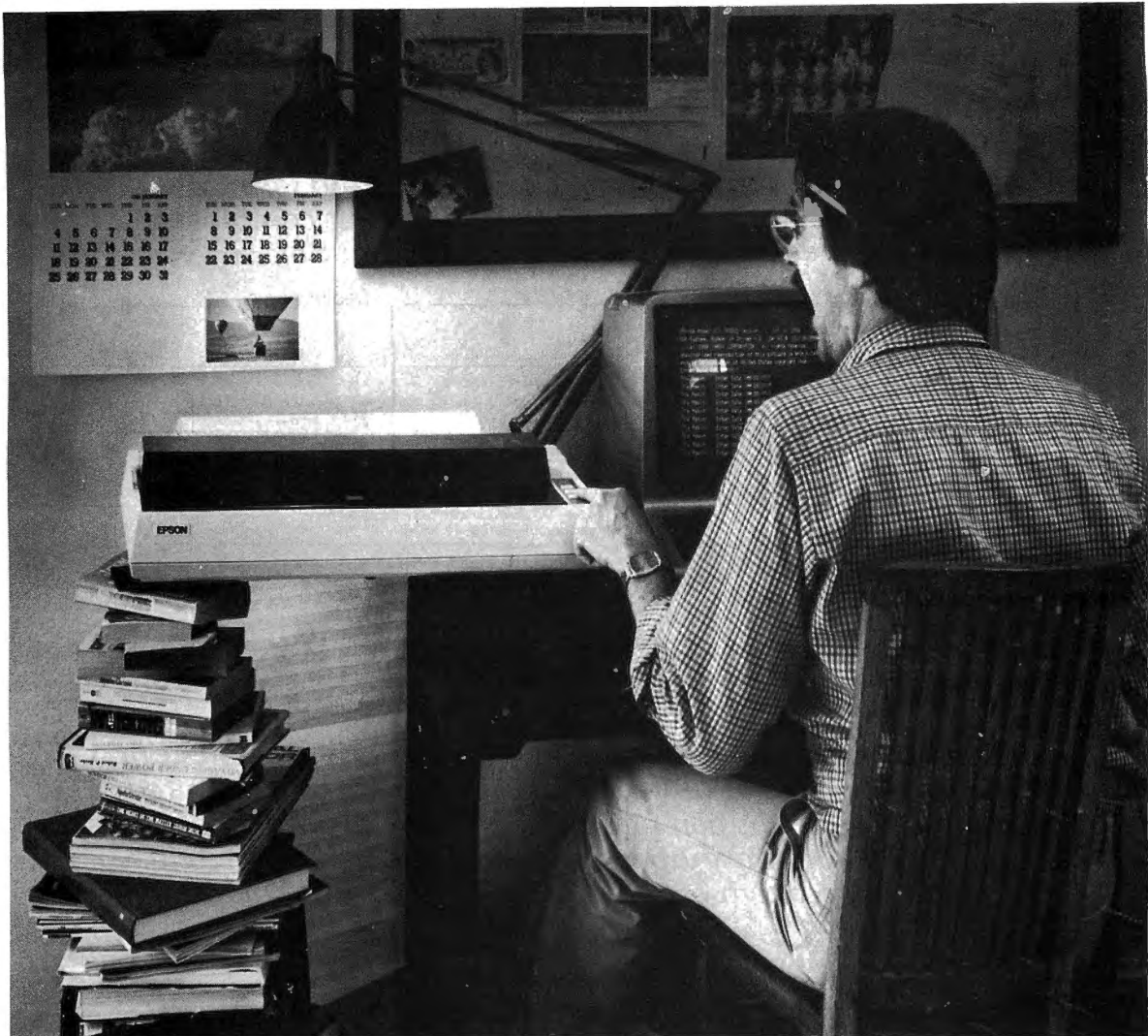
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Program continued

```

5999 GOTO 100
6000 CLS
6001 INPUT"ENTER DIRECT LABOR HOURLY RATE";DL
6010 INPUT"ENTER OVERHEAD PERCENTAGE";OH:OH=OH/100
6015 OS=0
6020 INPUT"(S) SCREEN OR (P) PRINTER";A$:IF A$="P"THEN OS=1:GOSUB 13000
6030 BC$="STATION--FACTORED HOURS--DIRECT LABOR--OVERHEAD--BURDENED COST"
6035 TD=0:TA=0:TB=0
6040 IF OS=1 THEN LPRINT;"DIRECT LABOR HOURLY RATE:";LPRINT USING C$;DL:LPRINT"OVERHEAD:";OH*100;"%":LPRINT:LPRINT BC$ELSE CLS:PRINT BC$
6050 FORK=1 TONS
6060 S=1:TF$(X)=0
6070 IFS>20 THEN 6080 ELSE IF IN(X,S)=0 THEN 6080 ELSE TF$(X)=TF$(X)+FH$(X,S):S=S+1:GOTO 6070
6080 DL(X)=TF$(X)*DL:OH(X)=DL(X)*OH:BL(X)=DL(X)+OH(X):TD=TD+DL(X):TA=TA+OH(X):TB=TB+BL(X)
6090 IF OS=1 THEN LPRINT TAB(3);X;LPRINT TAB(12);"";LPRINT USING F$;TF$(X);LPRINT TAB(26);"";LPRINT USING C$;DL(X);LPRINT TAB(38);"";LPRINT USING C$;OH(X);LPRINT TAB(50);"";LPRINT USING C$;BL(X):GOTO 6120
6100 LPRINT TAB(3);X;LPRINT TAB(12);"";LPRINT USING F$;TF$(X);LPRINT TAB(26);"";LPRINT USING C$;DL(X);LPRINT TAB(38);"";LPRINT USING C$;OH(X);LPRINT TAB(50);"";LPRINT USING C$;BL(X)
6110 IF X/10=INT(X/10) THEN GOSUB 11000:CLS:PRINT BC$
6120 NEXT X
6130 IF OS=1 THEN LPRINT"";LPRINT TAB(9);"ASSEMBLY COST";LPRINT TAB(26);"";LPRINT USING C$;TD:LPRINT TAB(38);"";LPRINT USING C$;TA:LPRINT TAB(50);"";LPRINT USING C$;TB:LPRINT:GOTO 6990
6140 LPRINT:PRINT TAB(9);"ASSEMBLY COST";LPRINT TAB(26);"";LPRINT USING C$;TD:LPRINT TAB(38);"";LPRINT USING C$;TA:LPRINT TAB(50);"";LPRINT USING C$;TB
6990 GOSUB 11000
6999 GOTO 100
7000 CLS:INPUT"EDIT WHICH STATION";X:IF X<1 OR X>NS THEN 7000
7010 PRINT 64,"EDIT WHICH ITEM";INPUT A:Y=1
7015 IF IN(X,Y)=A THEN 7030 ELSE IF Y=20 THEN 7020 ELSE Y=Y+1:GOTO 7015
7020 PRINT"ITEM";A;"NOT FOUND. CONTINUE TO EDIT (Y/N)";INPUT A$:IF A$="Y" THEN 7000 ELSE 7999
7030 CLS:PRINT 60,"STATION NUMBER:";X;PRINT 6120,"ITEM NUMBER:";I N(X,Y);PRINT 6192,"PART NUMBER:";PN$(X,Y);PRINT 6256,"QUANTITY";QT(X,Y);PRINT 6320,"RAW MINUTES FOR A SINGLE ITEM:";RM(X,Y)/QT(X,Y);
7040 PRINT 6440,"EDIT (1) ITEM NUMBER (2) PART NUMBER (3) QUANTITY (4) RAW MINUTES (5) QUIT";INPUT A:IF A<1 OR A>5 THEN 7040
7045 PRINT 6576,"":ON A GOTO 7050,7060,7070,7080,7090
7050 PRINT 6640,"NEW ITEM NUMBER";INPUT IN(X,Y):GOTO 7030
7060 PRINT 6640,"NEW PART NUMBER";INPUT PN$(X,Y):GOTO 7030
7070 PRINT 6640,"NEW QUANTITY";INPUT A:RM(X,Y)=RM(X,Y)/QT(X,Y):QT(X,Y)=A*RM(X,Y):RM(X,Y)*QT(X,Y):GOTO 7030
7080 PRINT 6640,"NEW RAW MINUTES";INPUT RM(X,Y):RM(X,Y)=RM(X,Y)*QT(X,Y):GOTO 7030
7090 FM(X,Y)=RM(X,Y)*PF:PH$(X,Y)=FM(X,Y)/60
7999 GOTO 100
8000 OVERRROR GOTO 12000:CLS:INPUT"ENTER NAME FILE IS TO BE SAVED UNDER";F$
8005 GOSUB 13500
8010 INPUT"INSERT DATA DISK IN DRIVE AND PRESS <ENTER>";A$
8020 OPEN"O",1,F$:PRINT#1,NS,PF
8025 FORK=1 TONS:PRINT#1,PS(X):NEXT X
8030 FORK=1 TONS:FOR Y=1 TONS(X)
8040 PRINT#1,IN(X,Y),QT(X,Y),RM(X,Y),FM(X,Y),PH$(X,Y)
8050 NEXT Y:NEXT X
8060 FORK=1 TONS:FOR Y=1 TONS(X)
8070 PRINT#1,PN$(X,Y)
8080 NEXT Y:NEXT X
8090 CLOSE
8998 GOSUB 11000
8999 GOTO 100
9000 OVERRROR GOTO 12000:CLS:INPUT"ENTER NAME OF FILE TO BE RETRIEVED";F$
9010 INPUT"INSERT DATA DISK IN DRIVE AND PRESS <ENTER>";A$
9020 OPEN"R",1,F$:INPUT#1,NS,PF:GOSUB 14000
9022 PRINT"PERFORMANCE FACTOR IS";PF
9025 FORK=1 TONS:INPUT#1,PS(X):NEXT X
9030 FORK=1 TONS:FOR Y=1 TONS(X)
9040 INPUT#1,IN(X,Y),QT(X,Y),RM(X,Y),FM(X,Y),PH$(X,Y)
9050 NEXT Y:NEXT X
9060 FORK=1 TONS:FOR Y=1 TONS(X)
9070 INPUT#1,PN$(X,Y)
9080 NEXT Y:NEXT X
9090 CLOSE
9998 GOSUB 11000
9999 GOTO 100
10000 CLS:END
11000 PRINT"PRESS <ENTER> TO CONTINUE"
11010 AS=INKEYS:IF A$="" THEN 11010 ELSE RETURN
12000 CLOSE:PRINT"ERROR:GOSUB 11000:RESUME 100"
13000 P=PEEK(14312):IF P>128 THEN CLS:INPUT"PRINTER NOT READY. A BORT (Y/N)";A$ ELSE GOTO 13020
13010 IF A$="Y" THEN OS=0:GOTO 13020:ELSE INPUT"READY PRINTER AND PRESS <ENTER>";A$:GOTO 13000
13020 RETURN
13500 PRINT"+ + SCANNING ARRAYS + +":FORK=1 TONS:S=1
13510 IFS>20 THEN 13520 ELSE IF IN(X,S)=0 THEN 13520 ELSE S=S+1:GOTO 13510
13520 PS(X)=S-1:NEXT X:RETURN
13600 CLS:PRINT"PERFORMANCE FACTOR IS";PF:INPUT"NEW PERFORMANCE FACTOR";PF
13610 GOSUB 13700
13620 FOR X=1 TONS:FOR Y=1 TONS(X)
13630 FM(X,Y)=RM(X,Y)*PF:PH$(X,Y)=FM(X,Y)/60
13640 NEXT Y:NEXT X:GOSUB 11000:GOTO 100
13700 PRINT"+ + ADJUSTING ARRAYS + +":RETURN
14000 CLS:PRINT CHR$(23);PRINT 6464,"INITIALIZING"
14010 DIM IN(NS,20),PN$(NS,20),QT(NS,20),RM(NS,20),FM(NS,20),PH$(NS,20),TF$(NS),DL(NS),OH(NS),BL(NS),PS(NS)
14020 FORK=1 TONS:FOR Y=1 TONS(X)
14030 IN(X,Y)=0:PN$(X,Y)="" :QT(X,Y)=0:RM(X,Y)=0:FM(X,Y)=0:PH$(X,Y)=0
14040 NEXT Y:NEXT X:RETURN
    
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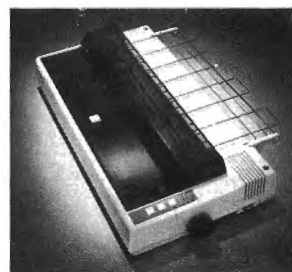
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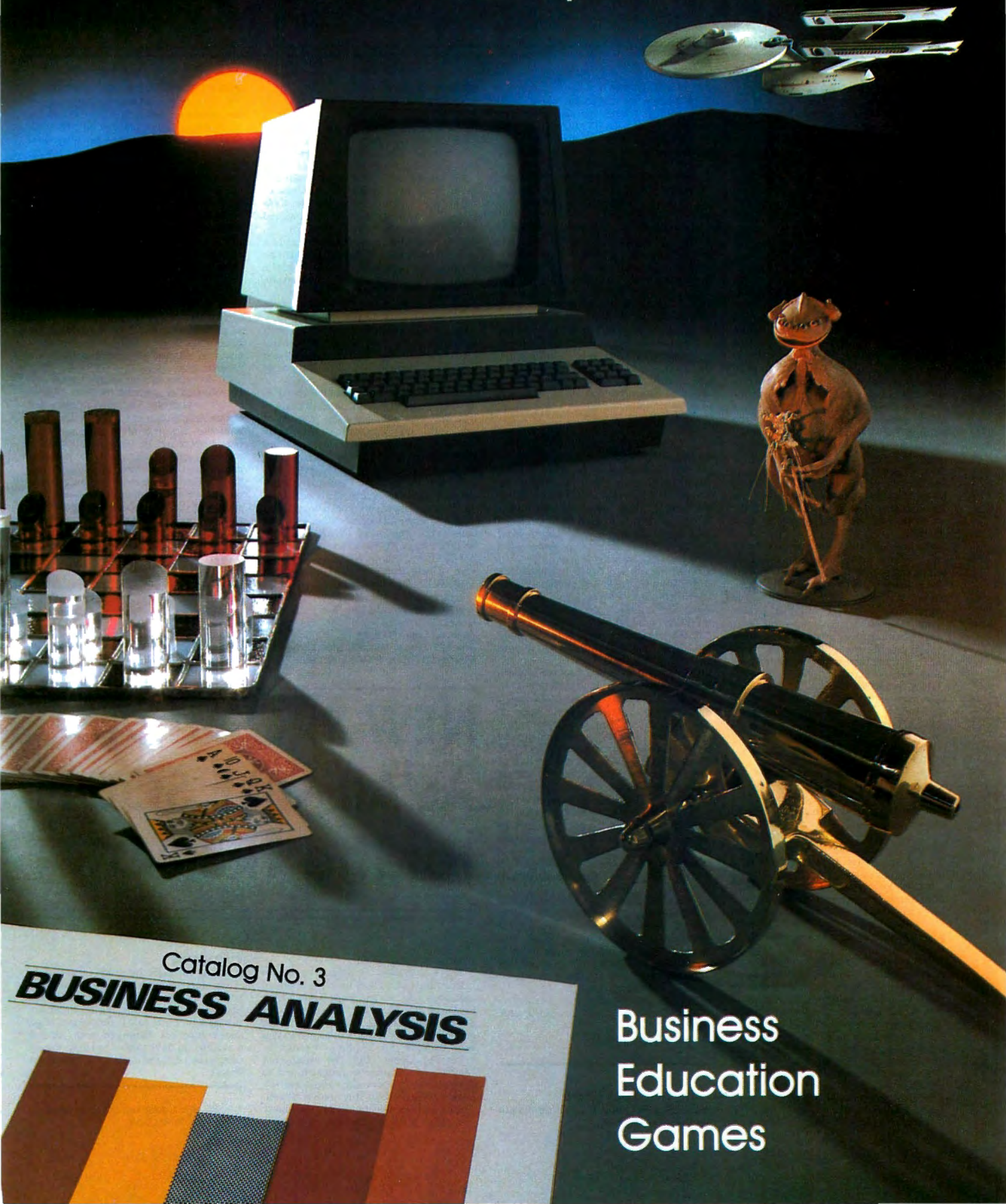
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Wayne Green's anticipation of the growing demand for microcomputer software brought about his establishment of Instant Software back in early 1978. At that time, Instant Software consisted of a handful of employees, and produced six programs.

Today, Instant Software employs fifty five people and produces over one hundred software packages for the TRS-80, Apple, Pet, TI, and Northstar. We have over 200 more in the development stages, including programs for the TRS-80 Color, Atari and Casio computers. The rapid rate of development of microcomputer software by today's top-notch programmers pushes the industry's standards higher. For this reason, several months ago, we began an extensive review of each Instant Software product. The results . . . temporarily, a smaller product line, but a top-notch one.

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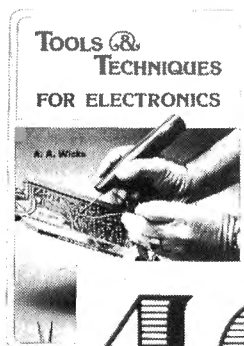
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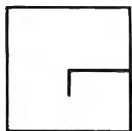
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MAIL/FILE

from Galactic Software Ltd.
A Mailing List for the TRS-80 Model I or Model II

Instant Software always tries to provide you with the best software on the market. Although the Mail/File mailing list program is not published by us, it is so good that we want you to try it.

We have two versions of this mailing list. Pkg. 5000RD is for the Model I with the 5-inch disk drive and Pkg. 5001RD is for the Model II with the 8-inch disk drive. The programs are essentially identical except for the storage media and their respective capacities. With the 5-inch drive, you can store up to 600 names per disk without DOS, or 300 names per disk with DOS. With the 8-inch drive, you can store up to 2500 names per disk, with or without DOS. (If your list is larger than the single disk maximum, it can be distributed over several disks.)

The program maintains separate alphabetical and ZIP code files under constant sort. When you add a name to your list it will be inserted into its correct position in the files. You will never have to sort your list; it will always be ready to print labels.

The program will record your data in nine fields: two for NAME, and one each for ADDRESS, CITY, STATE, ZIP CODE, PHONE NUMBER, PHONE EXTENSION, and a five-character CODE field. When you print labels, you have a choice of three different label formats: a three-line label, a four-line label or a user-defined label. In the three-line and user-defined label formats, you may include a message line on your label.

The best feature of this program is the sort process that lets you determine which labels will be printed. You may specify either alphabetical or ZIP code order for all or any part of your list. For example, you can print labels for everyone on your list whose name begins with the letter A, or for all of those people who have the same ZIP code. You can even print labels for only those people named Jones, who are living in a given city or state. (Note: The Model II version can search for both first and last names, e.g., John Jones.) Furthermore, you can choose to print labels by using any single field (i.e., specific cities, states, phone numbers, etc.). You may assign specific codes to any name in the CODE field. For example, ACT could stand for active accounts, and INACT for inactive accounts. If you wanted to send a letter to all of your inactive accounts, you would specify the CODE INACT, and labels would be printed only for your inactive accounts. When you print labels, you may specify up to nine different CODES at one time. If your data matches any one of the CODES a label will be printed.

Files created with the Model I version of this program can be transferred to the Model II version, when you upgrade your hardware.

Package 5000RD requires the following minimum system:

1. A TRS-80 Model I, Level II with 16K RAM.
2. An Expansion Interface with 16K RAM (or more).
3. One (or more) mini-disk drives.
4. A compatible printer (80 or 132 columns).
5. TRSDOS Version 2.3.

5000RD Model I (Disk) \$99.00

5001RD Model II (Disk) \$199.00

BUSINESS ANALYSIS

(Formerly Oracle-80)

Business Analysis will provide you with analytical and forecasting capabilities previously available only in large computer and time-sharing systems. It is a flexible, professional time series package that can be used in sales analysis and forecasting, product planning, business planning, etc. The professional forecaster will recognize BUSINESS ANALYSIS as a tool which incorporates all the power of the X-11 model and extends it. Investors can analyze stocks, market trends and growth rates. Financial managers and economists can analyze the general economic climate and investigate business cycles. Even families can find this program useful in analyzing spending or energy consumption trends, for it is ideal for anyone who needs to analyze and forecast monthly, quarterly or annual data.

Even though this package uses advanced statistical methods, you don't have to understand higher math to use it. Designed to be used and understood by the typical business person, its powerful analytical capabilities will satisfy even the professional forecaster. All inputs and outputs are written in plain English and the documentation carefully explains all functions.

Adding, deleting and modifying data is accomplished with a very flexible editing routine. Automatic scaling of numbers, ability to choose from several output formats, a calendar format that identifies all your data by month/quarter/year, and the ability to add and subtract values while inputting from the keyboard provide added user flexibility. You can use several methods—moving average, rate of change, seasonal indices or cyclical indices—to analyze your data. The unique graphing capability lets you visualize your historic data or any of the modified data series you calculate, and direct any chart or graph to your printer.

Business Analysis will forecast future data values using trend, moving averages or seasonal methods. You may choose either constant unit-trend or a constant percentage-growth-trend forecast for even more flexibility.

This is one of the most powerful and useful business tools you will ever use. It puts the future in your hands.

The package requires the following minimum system:

1. A TRS-80 Level II with 16K RAM.
2. An Expansion Interface with 16K RAM.
3. One or more disk drives.
4. Any compatible Disk Operating System.
5. An optional line printer.

Note: Tape version only is Model III compatible.

0140R (Tape) \$75.00

0152RD (Disk) \$99.95

LABEL

Are you tired of trying to remember which line numbers of your program cor-

respond to which routines in it?

Well, Instant Software has solved your problem! With the LABEL program in place, you can forget about such trivial things and rely on the names you have given the routines. You can use LABEL to keep track of these things for you and get down to serious programming.

LABEL allows you to use labels in place of line numbers in GOTOS, GOSUBS, IF...THENs, THEN...ELSEs, RESUMEs, ON ERRORs, ON X GOTOS, and ON X GOSUBS.

After you finish with your program, you can have it converted into a normal program (with line numbers in place of the labels in GOTOS, etc.) and execute it in computers without the LABEL program. With this conversion you have three options:

1. The labels are left at the beginning of the routines, but changed to line numbers in the program statements.

2. The labels at the beginning of the routines are changed to REM statements, and changed to line numbers in program statements.

3. The labels at the beginning of routines are deleted, and changed to line numbers when in program statements.

While you are using LABEL to write your program, you can have it list all the lines which have label identifiers (to either the video of the line-printer), you can search the program for the line number of a particular label, or you can use it to delete all the lines that begin with a REM.

LABEL is compatible with TRSDOS 2.1, 2.2, 2.3, and with NEWDOS and Percom MicroDOS. Model I, Level II, 16, 32 or 48K.

0168R (Tape) \$24.95

ONE-D MAILING LIST

Here is a mailing list system that can be run on only one disk drive! You can have up to 17 fields of selection for name/address retrieval.

Disk versatility allows you to add, delete, or change the numerous details stored in the system.

Features of the One-D Mailing List include:

- * Automatic name sort (with zip code option).
- * Rapid access to any name on file.
- * Easy error correction and recovery.
- * Prints selective name listings.
- * Revise or update listings at any time.
- * Up to 2500 names on-line (with 4 drives).
- * Prints a list of all names on file.
- * Prints mailing labels.

This package requires the following minimum system:

1. A TRS-80 Model I, Level II with 16K RAM.
2. An Expansion Interface with 0 to 32K memory.
3. A single disk drive (with automatic upgrade for up to three additional disk drives).
4. Any compatible Disk Operating System.

0123RD (Disk) \$24.95

USER'S TIPS

When writing BASIC programs, place the most often used routines at the front of the program. This will enable the program to run faster.

Utilities for your TRS-80

DYNAMIC DEVICE DRIVERS

Are you tired of working around all of the little "obstacles" that are built into your TRS-80? Ever wish that there was some way to "repair" those imperfections?

Well, here it is! The DYNAMIC DEVICE DRIVERS package has all of these features:

PROGRAMMABLE KEY DEBOUNCE—Your keyboard can be "tuned" to your typing style.

PROGRAMMABLE REPEATING KEY FUNCTION—Every key has a repeat function.

LOWERCASE MODIFICATION SUPPORT—You have choice of standard or shift-for-lowercase letters. (A lowercase hardware modification must be installed.)

BETTER THAN NOTHING GRAPHICS—Graphics characters will be converted to the closest ASCII character.

PRINTER/SCREEN AUTO SWITCHING—If your printer is accidentally turned off, your program won't bomb.

PROGRAMMABLE PRINTER FORMS CONTROL—You control the format for printer output.

PROGRAMMABLE KEYBOARD LOCK—Only you will know the secret code to unlock your keyboard.

With the Dynamic Device Drivers package, you can look forward to working WITH your TRS-80, instead of against it! Model I, Level II, 16K.

0228R (Tape) \$19.95

0199RD (Disk) \$24.95

DISK EDITOR

Disk Editor is a powerful machine-language utility program that will allow you total access to ANY byte of information in ANY sector of ANY track of your disks. It is a fast, simple, and efficient method of modifying files—whether BASIC programs, SYSTEM programs, or just data. All commands are readily accessible, with no need to refer to a command table.

With Disk Editor you can examine, alter, add, and delete information with ease. Information can be retrieved from the disk by supplying track and sector information, or by giving the filespec. You can even search the disk for a specific string of characters (up to 8 characters long).

If you need hardcopy, use the LINE-PRINT command to send a copy of the video display to your lineprinter.

You can transfer command from Disk Editor to Radio Shack's DEBUG and back, allowing dynamic debugging of disk I/O procedures.

Disk Editor is compatible with TRS-DOS 2.1, 2.2, and 2.3, as well as with Apparat's NEWDOS. It is even capable of reading disks made by Percom's Micro-DOS.

There are two versions of Disk Editor: one is for a 35-track DOS, and the other is for a 40-track DOS. Both are included in this package.

This package requires the following minimum system:

1. A TRS-80 Model I, Level II, 16K RAM.
2. An Expansion Interface.
3. A single Disk Drive.
4. Any compatible Disk Operating System.

(Disk Editor is not compatible with VTOS 3.0).

0180RD (Disk) \$39.95

MASTER DIRECTORY

Wasn't it just yesterday you threw the cat into the washing machine because you were frustrated at not being able to find that Adventure that you saved on disk last week? Or, was it just yesterday that you force-fed that leftover hot tamale sauce to your mother-in-law because you had searched in vain for your backup copy of the Electric Pencil? And you say your three-year-old built a house of cards out of your carefully-filed business data disks and now you don't know which is which? Well, chin up, Bucky, 'cause MASTER DIRECTORY is here!

The MASTER DIRECTORY is a disk file storage program that reads the files on all your disks, stores the file names and extensions, and even records the free space on each disk. All you have to do is number the disks in your library and the MASTER DIRECTORY will keep track of their contents. You can read the names, displayed alphabetically, search the DIRECTORY for file names and extensions, delete disks and search for free space. You can store 5000 files or 320 disks, whichever comes first.

Your disk storage problems are over now that the MASTER DIRECTORY is here. Model I, Level II, 16K RAM. Expansion Interface plus 1 disk drive.

5005RD (Disk) \$29.95

DISK SCOPE

Need to check out a disk? Perhaps you want to see how the files are stored, or you forgot your password. No problem! Now you've got Disk Scope!

If you know the name of the file, the Fileloc program will show you what tracks and sectors on the disk contain that file, as well as how much memory the file takes when loaded into RAM. This works for both program and data files. Fileloc then allows you to print the information, restart the program or exit to BASIC. The information obtained allows you to use the CDISK program effectively.

CDISK is a powerful little BASIC utility and test program. It will allow you to view any track and sector on your disks in ASCII, Hex and screen POKES. It totally disregards protection codes. It can also be used to randomly check all 350 sectors of your disk for read errors.

You don't know the whole file name if you haven't got the password, so the PASSWORD program has been included in the Disk Scope package. This machine-language utility not only gives you a password for files, but for the whole disks as well. Whether you're a novice or a pro, if you use a disk system, you need Disk Scope.

This package requires the following minimum system:

1. A TRS-80 Model I, Level II, 16K RAM.
2. An Expansion Interface.
3. A single disk drive.
4. Any compatible Disk Operating System.

0139RD (Disk) \$19.95

TLDIS & DLDIS

You've bought a super machine-code program, but now wonder how it works. Maybe you even used a quick PEEK routine to glance through it when it was in memory. If so, you definitely noticed the complete lack of comments in the code, making it almost impossible for you to decipher and understand it.

Well, Instant Software's Labeling Disassemblers are the answer to your problem. TLDIS (Tape-based Labeling Disassembler) and DLDIS (Disk-based Labeling Disassembler) make three passes to assign labels (where appropriate) to the routines in a machine-language program. Their output is almost identical to that of a hand-assembled source code.

You can send the disassembly to a lineprinter (Radio Shack parallel port) for either TLDIS or DLDIS. (The difference between these utilities is the storage mode of the disassembly.)

TLDIS can send the disassembly to cassette tape, DLDIS can send it to disk; both send it to the video monitor. The stored disassembly from TLDIS may be reassembled with Radio Shack's EDTASMTM—the disassembly from DLDIS, with Apparat's extension of EDTASMTM. Because of the use of labels, it is a simple matter to change any object code program by disassembling it and then making changes to the resultant source code, without losing track of jump/load addresses. Labels start with "AA00" and increment up, in even numbered steps (AA02, AA04, etc.). The odd numbers (AA01, AA03, etc.) are left for you to use for the source code during reassembly.

The printing of the disassembly may be temporarily halted by using ((SHIFT)) @ (just as in BASIC) or it may be ended by pressing the ((BREAK)) key. It also has a comments column to display ASCII characters used in a LD or CP opcode.

TLDIS and DLDIS may be relocated in memory to avoid conflict with the program you disassemble.

The next time you need to "climb inside" a machine-code program, take DLDIS or TLDIS with you. We promise that it will be an easier journey. Model I, Level II, 16K; Model III, 16K.

0230R (TLDIS-Tape) \$14.95

0231RD (DLDIS-Disk) \$19.95

RENUM/COMPRESS

Add a new command to your TRS-80! RENUM/COMPRESS fits in the top 767 bytes of memory and you call it like any BASIC command.

You forgot an INKEYS routine and there's no space for a new line number? The command allows you to renumber your BASIC program. You can set the new starting line number and the increment or (like any good command) it will default automatically to standard values.

You think memory is going to be tight? This command allows you to compress the program instantly by removing REM statements and any spaces outside of quotes!

If you're a BASIC programmer, this is the one utility you should have loaded and ready to go! Add the command: RENUM/COMPRESS!! Note: Not disk compatible. Model I, Level II, 16K.

0133R (Tape) \$14.95

IRV

IRV, one of the most powerful utility programs available, turns your keyboard into a SUPERKEYBOARD.

Now you can have single key programming. IRV comes complete with its own keyboard definitions, or up to 255 characters can be assigned to every key, including (ENTER) and (BREAK). You can enter often-used BASIC words, variable names or even entire lines. Even functions, such as RUN, LIST, or EDIT can be entered with a single keystroke.

The relocate feature of IRV is unique, in that it allows single line relocation and renumbering. You can merge lines using the EDIT function and a single keystroke.

As a video editor, IRV is so powerful, you'll wonder how you got along without it. Full cursor control, blinking cursor, block movement and special erase functions are just the beginning. Frequently used video graphics blocks can be saved and used again and again. Even IRV's minor virtues are impressive. You can have auto repeat with any key, including programmed functions. You won't have to pull plugs or fiddle with a control box to rewind or fast-forward a tape. The cassette recorder can be controlled from the keyboard.

If you are a creative programmer (or wish to be), you need the power and convenience of IRV! Tape version, Model I, Level II, 16K. Disk version, Model I, Level II, 16K. Expansion Interface plus two disk drives.

0250R (Tape) \$24.95

0350RD (Disk) \$29.95

COMPRESSION UTILITY PACK

Do you want to add sound routines to a Space Trek program that already uses 16K? Or maybe you need an extra column in that financial report program, but when you run it, you get OM errors?

With a wave of your hand, and a little help from either of the COMPRESSION programs in this package, your problems are over.

COMPRESS-80—Fits in 265 bytes, deletes spaces, and offers the choice of leaving REMark line numbers in the program, or deleting them altogether.

SUPERCOMPRESS—Uses 767 bytes and can do everything COMPRESS-80 can do PLUS, it packs the program into the smallest possible number of multiple statement lines.

With the Compression Utility Pack and your own programming skill, you can add all those little extras to your BASIC programs. Model I, Level II, 16K.

0246R (Tape) \$19.95

THE DISASSEMBLER

This is a single-pass, hex-notation disassembler that will send its output either to tape or to a lineprinter (Radio Shack parallel port). The tape output is directly compatible with Tandy's EDTASMTM. Thus, you can take an object code tape, disassemble and output it to tape, then use EDTASMTM to add, delete, change and even re-assemble your new version.

In addition, it shows the displacement and absolute address of any relative jumps made by the disassembled program. It also displays any ASCII characters used in an LD or CP opcode.

Since the Disassembler works only on in-memory programs, it has been made relocatable so that you may move it around in memory to avoid conflict with the program you wish to disassemble. As an added option, you may also jump to memory locations and transfer control between Disassembler and other utility programs in your computer.

The Disassembler—use it to examine and analyze any resident machine-code program! Model I, Level II, 16K; Model III, 16K.

0232R (Tape) \$9.95

Education for your TRS-80

PROGRAMMER'S PRIMER

Sometimes thousands of words can't give a clear picture of complicated theories and concepts. There are times when a chart or picture is worth those kilo-words, and more! The novice computer programmer is offered this breath of fresh air in an otherwise stuffy situation—the PROGRAMMER'S PRIMER.

This program functions as a Computer Aided Instruction package to introduce the novice programmer to several important computer concepts. It graphically explains the relationship of decimals to hexadecimal in the Decimal:Hexadecimal Conversion routines. Data storage is explained with the Subscription of a Variable and Three Dimensional Array routines. The logic of program flow is shown in the For-Next Loops flow chart demonstration. Finally, the Bubble Sort sorting technique is shown, in a fascinating display of what a computer can do best.

Don't be a "scratch your head in wonder" boy any longer. Let the PROGRAMMER'S PRIMER package from Instant Software help you on your way down the primrose path of programming! Model I, Level II, 16K; Model III, 16K.

0245R (Tape) \$9.95

PROGRAMMER'S CONVERTER

This package contains three programs that can aid you in converting to other number-base systems.

BASE CALCULATOR—Turn your TRS-80 into a calculator. Convert numbers to any base from 2 through 16 and perform calculations in that base. Memory, sign change, one's and two's complement are all available. It will even handle fractions.

HEXADEcimal/DECIMAL CONVERSION TRAINING—A dual-purpose program. First, it's a handy converter that changes decimal numbers to hexadecimal notation (and vice versa). Second, it's a teaching/testing program that gives you practice in making those conversions yourself.

NUMBER BASE CONVERSIONS—Converts any decimal, binary, octal, or hexadecimal number (up to \$FFFF), to its equivalent value in the other three bases and displays all four values simultaneously.

You'll have a command of octal and hex notation—Instantly! Model I, Level II, 16K; Model III, 16K.

0058R (Tape) \$9.95

ULTRA-MON

ULTRA-MON is a unique and powerful machine-language monitor. It is ROM independent and will function in Level II or DOS BASIC. With ULTRA-MON, you will be able to write, modify, study and debug machine-language programs. Plus, you'll be able to avoid the frustration and "bomb-outs" usually associated with machine-language programming. ULTRA-MON displays, disassembles, traces (hardcopy trace disassembly, tool), modifies, relocates memory, prints and even relocates itself with simple commands. Using interpretive execution, ULTRA-MON allows you to put breakpoints in ROM. This powerful monitor can even fetch, decode, disassemble and analyze each instruction individually so that your program cannot bomb out.

ULTRA-MON is designed for the beginning machine-language programmer as well as the professional. The documentation contains a Simple Demonstration section geared to the novice. Consequently, the program is a learning device as well as an extremely useful programming tool.

If you are serious about programming, you need to add this powerful utility to your library today. Model I, Level II, 16K.

5003R (Tape) \$24.95

TEACHER'S AIDE

Now you can have the benefits of Computer Assisted Instruction (CAI) in your own home. The Teacher's Aide program will let you create a teaching system for any conceivable subject. The program allows you to create a question and answer lesson (you can input up to 8000 characters per lesson). You can then save this lesson on the disk and create an entire sequence of lessons.

Your lessons can be tailor-made for you or your students. The options available are: (1) Review the material prior to taking the lesson, (2) provide hints to help answer questions, and (3) offer a graphics display as a reward for correctly answering all the questions. The Teacher's Aide program will even allow for spelling errors!

Teacher's Aide is perfect for parents, teachers, and students who need the unlimited patience and undivided attention that only a computer can provide. Readin', Rittin', and Rithmetic will never be the same—now that you have the Teacher's Aide package from Instant Software. Model I, Level II, 16K, Expansion Interface + one disk drive. Recommended for teachers and parents.

0214RD (Disk) \$39.95

RECENTLY REVISED— NOW BETTER THAN EVER!!!

TYPING TEACHER

A complete seven-part package that guides you from familiarization of the keyboard through typing words and phrases to mastery of touch-typing. Your video monitor becomes a bottomless page for typing practice, and your own private TYPING TEACHER, ready to teach when you're ready to learn. Model I, Level II, 16K; Model III, 16K.

0099R (Tape) \$12.95

GEOGRAPHY EXPLORER: USA

The Geography Explorer: USA package is the most fascinating (and least painful) way of learning social studies that we've seen yet.

The program displays computer-generated maps of the United States, its seven regions, and its individual states. The student then answers questions about the states of a given region. These questions may be in Multiple Choice, Recognition or Fill-in format.

You can learn each state's name, capital, largest city, nickname, population, population rank, population density and percentage in urban areas, the state's flower, bird, tree, song and motto! Furthermore, Geography Explorer has a unique TEACHER mode which allows the teacher or parent to choose multiple options of how the material is to be presented. This permits directed learning for the student.

The package is also just plain fun! When the student answers the questions correctly, there are a variety of graphic rewards that flash on the screen to provide immediate, positive reinforcement.

As a bonus, this educational package can use a compatible Light Pen! The Light Pen can be used to respond to the MENU or to answer multiple-choice questions; simply point to the flashing square of your choice. (If you do not have a Light Pen, or you prefer not to use it, all responses can be entered from the keyboard.)

The union of sophisticated software with the speed and novelty of the Light Pen represents a milestone in Computer Assisted Instruction. As advanced as this package is, it can be readily used by grade-school students. Truly, it is educational software for any age.

We think you'll be equally impressed once you've explored these United States with the Geography Explorer. Model I, Level II, 16K, Expansion Interface + one disk drive. Light pen optional. Recommended age level six to adult

0071RD (Disk) \$49.95

SURVEYOR'S APPRENTICE

This program makes applied math fun! Actually, we use the concept of area every day. You buy land by the acre, rent office space by the foot, and buy advertising space by the column-inch. The Surveyor's Apprentice can teach you the formula used to find the area of any plane figure.

Programs cover rectangles (including both rhomboids and rhombuses) trapezoids, triangles, parallelograms (including both rhomboids and rhombuses) polygons. This three-part package displays on-screen diagrams of all the figures, gives the formula for the area of each figure, and even gives you examples of computations. You can even request a quiz to see how well you're doing.

Here's an excellent refresher course for people who use calculations in their work. Why not broaden your area of expertise with the Surveyor's Apprentice! Model I, Level II, 16K; Model III, 16K. Recommended age level Jr. High to adult.

0127R (Tape) \$9.95

BEGINNER'S RUSSIAN

In order to understand a foreign culture, you must know its language. In today's international politics and commerce, one of the most valuable languages to know is Russian. The Beginner's Russian package can put you well on the road to learning this vital language.

The three programs in this package will give you on-screen displays of the Cyrillic letters, detailed instructions on their proper pronunciation, and exercises that will have you recognizing and speaking simple Russian words.

This package is ideal for students, businessmen, scientists—perfect for anyone who is interested in learning the Russian language. Model I, Level II, 16K; Model III, 16K. Recommended age level 10 to adult.

0136R (Tape) \$9.95

EVERYDAY RUSSIAN

This package is the second in Instant Software's Russian language series. Everyday Russian will acquaint you with the words for various foods, places to eat, signs, and the names of stores—exactly what a traveller needs to know. You'll also learn the order of the Cyrillic alphabet.

Each of the three parts in this package will not only teach you the words but will also present you with a quiz as well. Just pick the words you want to work on. The computer will score how well you've learned your lesson.

You can even practice typing in Russian. The program will allow you to type in the letters, or words, using the complete Cyrillic alphabet. Practice writing words such as hotel names, tourist attractions, and street addresses.

Why be deaf and mute when faced with the richness of the Russian language? Discover it for yourself with the Everyday Russian package. Model I, Level II, 16K; Model III, 16K. Recommended age level 10 to adult.

0137R (Tape) \$9.95

RUSSIAN DISK

Beginner's Russian and Everyday Russian are available together on disk. Model I, Level II, 16K, Expansion Interface + one disk drive; Model III, 16K.

0212RD (Disk) \$24.95

ULTRA-MON AND MODEL III

Ultra-Mon is compatible with the Model III computer with this short lineprint patch. Enter the listed code at the designated address. The program must be located at its original loading address, 6E00.

7BBE	E5	PUSH HL	:SAVE HL
7BBF	F5	PUSH AF	:SAVE AF
7BC0	DB FB	IN A, (0F8H)	:GET PRINTER STATUS
7BC2	CB 6F	BIT 5,A	:PRINTER SELECTED?
7BC4	28 04	JR Z, 7BCAH	:SKIP IF NOT
7BC6	CB 7F	BIT 7,A	:PRINTER BUSY?
7BC8	20 F6	JR NZ, 7BC0H	:LOOP IF IT IS
7BCA	F1	POP AF	:GET AF
7BCB	D3 F8	OUT (0F8H),A	:SEND A TO PRINTER
7BCD	E1	POP HL	:RESTORE HL
7BCE	C9	RET	:RETURN
7BCF	00	NOP	
7BD0	00	NOP	

To enter the program from Ultra-Mon's register display mode, type the following sequence (s denotes space bar): MM7BBE s E5 s F5 s DB s FB s 28 s 04 s CB s 7F s 20 s F6 s F1 s D3 s F8 s E1 s C9 s 00 s 00 (enter).

Your printer will now operate normally. Please note that this patch does not check to see if there is paper in the printer.

In addition, the documentation describes 6CC as the way to go to basic. Model III basic is more effectively entered from location 1A19. Where the documentation suggests the command E6CC.418E (enter), you should type E1A19.418E.

Games, Simulations and Entertainment for your TRS-80

AIR FLIGHT SIMULATION

Air Fright might be more like it! Instrument takeoffs and landings are no picnic—ask any pilot—and this computer simulation is certain to keep you on the edge of your seat.

You'll feel the adrenalin flowing, which accounts for the great popularity of flight simulation. Here's a program that provides a real sense of accomplishment, as you progress from takeoffs to tailspins and from landings to loops.

You begin with a full tank of gas and a flight plan that calls for a simple takeoff and landing—at least until you get the hang of it. Pay close attention to your instrument panel, especially the angle of ascent/bank indicator and air speed indicator—too steep a bank and your air speed will drop like a stone and so will your plane.

It's about as close to the real thing as you can get this side of a runway, and once you get some flight time under your belt, the sky's the limit. You can use the program to fly a course against a map—even try your hand at acrobatic maneuvers! Fun for the whole family. Model I, Level I; Model I, Level II, 16K; Model III, 16K.

0017R (Tape) \$9.95

ALIEN ATTACK FORCE

(Formerly Invaders)

The invaders are coming! Earth's defenses are dead except for your Laser base. Your assignment is to destroy the approaching ALIEN ATTACK FORCE before it destroys Earth. Before Earth's sensors failed, they detected 550 armed invaders in space, speeding toward us in 10 attack formations of 55 in each group. The sensors detected four different types of attack craft: Large, Medium, Small, and a short profile craft which is the most difficult to destroy. If you cannot stop these space attackers they will stop Earth... for good. Model I, Level II, 16K; Model III, 16K.

0240R (Tape) \$9.95

BALL TURRET GUNNER WITH SOUND

For years the Petro Resource Conglomerate has attacked our photon collection stations and strangled our deep-space trade routes. The PRC Exxonator Class light fighters (code name: Gnat) have been their main weapon. Now you can strike back, by joining the Ball Turret Gunner Service.

Imagine yourself at the control console of an LW-1417 Stratoblazer (Type B Strategic Laser Weapon). Your Hindsight Director informs you that a Gnat fighter is coming in for an attack. You pivot your gigawatt laser turret until you can see the target on your monitor. The Range Indicator shows him coming in fast. The Targeting Computer studies his course and speed as your finger tenses over the firing key. You know you'll have only a fraction of a second in which to react. The Gnat fighter's evasive maneuvers cause him to dance in your sights. Suddenly, you see the FIRE command and you react instinctively. Your laser beam lashes out and reduces the Gnat to an expanding ball of ionized gas. Mission accomplished!

Ball Turret Gunner, with your choice of multiple levels of difficulty, optional sound effects and superb graphics, is more than just a game. It's an adventure. Experience it! Model I, Level II, 16K.

0051R (Tape) \$9.95

JET FIGHTER PILOT

The Jet Fighter Pilot package takes you as close to real combat flying as possible... without pulling G's.

In this brilliantly realistic simulation, you become the pilot of a high performance, twin turbo-jet fighter. Total control of the aircraft is yours.

At the start of your mission, you'll go through an entire engine start procedure before your flight (provided your ground maintenance is up to par). Your takeoff will be from either the deck of an aircraft carrier (via a steam catapult) or from an airfield.

All controls respond the same as they would on a real jet fighter. You'll have to constantly monitor your display and make adjustments to your throttle, flaps, rudder and air spoilers. You decide when to retract flaps, landing gear and release the auxiliary fuel drop-tanks.

Your on-board navigational computer will direct you to your selected airport. The Glideslope/Localizer information will aid you in approaching and landing on an aircraft carrier deck or airfield.

The Weapons Control Computer will arm your missiles, provide you with the range and bearing to a target, and tell you when to attack. And, if things should get a little too hot, you have an ejection seat command for egress.

For a carrier-based landing, you'll have to deploy your tail hook. For a land-based landing, you'll need reverse thrust and to deploy your drag chute.

After you've flown a few missions with the Jet Fighter Pilot package, you'll know you've earned your wings. Model I, Level II, 16K; Model III, 16K.

0159R (Tape) \$14.95

SWAMP WAR

Your (formerly) trusty ship, The Stellar Spaniel, has lumbered its last lightyear. An unfortunate encounter with a neutron star has damaged your hyperspace drive, you are stranded on a water-covered planet. Fortunately, you have managed to make it to one of the nine adjacent islands that compose this world's only dry land.

On each island, you discover the remains of an earlier landing party. Apparently, they were wiped out before they could finish building their supply transporters. A brief inspection reveals that each may safely transport you as far as one of the other islands.

There is evidence of all sorts of reptilian life—some small, some not so small, and some INTELLIGENT! You have an uneasy feeling that your sojourn here may not be entirely without incident... This feeling is transformed to terror when you find yourself suddenly surrounded by sapient swamp creatures shooting at you.

Your only hope is to use your maintenance "droids to collect all the transporters and to clear the islands of the swamp creatures. Duck, dodge, shoot back... do what you must—but survive the Swamp War!

The Swamp War program includes variable levels of difficulty, automatic score-keeping and fast-paced graphics with optional sound effects. Model I, Level II, 16K; Model III, 16K.

0312R (Tape) \$14.95

DANGER IN ORBIT

(Formerly Asteroid)

DATE: 28.02.2047

LOCATION: 270 million miles from Terra
MISSION: Maintaining Terra's Space Lanes

Briefing will follow:

1.1 Your mission is to destroy any asteroids in your sector and to prevent alien spacecraft from infiltrating the Terrestrial Defense Network.

1.2 Your ship is armed with an anti-matter cannon. You can shoot large asteroids, but this turns them into many smaller asteroids, each capable of destroying your ship.

1.3 In addition, alien ships can make instantaneous hyperspace jumps into your area and start firing on your ship.

1.4 You'll need lightning reflexes and nerves of steel to survive DANGER IN ORBIT. We have no use for non-survivors!

DANGER IN ORBIT, a real-time, machine-language game, features variable levels of difficulty, superb high-speed graphics, sound effects and automatic scorekeeping. Tape version: Model I, Level II, 16K; Model III, 16K. Disk version: Model I, Level II, 16K. Expansion Interface + one disk drive.

0237R (Tape) \$14.95

0247RD (Disk) \$19.95

AIRMAIL PILOT

Picture the Pony Express with wings—that's Airmail Pilot! In place of hostile tribes and highwaymen, the pioneers of the airmail routes faced other dangers. They fought treacherous winds and thermals, sudden storms, and a constant battle with time. All of this to prove early airmail service was dependable and worthwhile.

Here's a program that lets you go back in time to the early days of aviation. You must fly the mail from Columbus to Chicago. Your Jenny, a cloth-covered biplane, must take you through unpredictable winds and electrical storms. The on-board clock will time your flight. You must get the mail through in the shortest time possible.

It's more than a game. You become totally involved in your mission. Not only is your reputation as pilot at stake, the future of Airmail—the bold new arm of the postal service—rides with you. Model I, Level II, 16K; Model III, 16K.

0106R (Tape) \$9.95

DR. CHIPS

When the problems of your world begin to pile up, you can now turn to your own livingroom "psychiatrist"—DR. CHIPS.

The good Doctor is there whenever you need him for as long as you need him. He may not solve any of your problems but we're sure you'll be amused at his responses.

Why shoulder the burdens of modern life in silence? Put your TRS-80 and DR. CHIPS to work today and get it all off your chest! Model I, Level II, 16K; Model III, 16K.

0218R (Tape) \$9.95

FLIGHT PATH

Experience all aspects of modern aviation with FLIGHT PATH.

MOUNTAIN PILOT—Transforms you into a daring bush pilot as you fly badly needed supplies to a remote gold mining camp. You must cross a hazardous mountain range, while struggling with headwinds, tricky navigation and diminishing fuel.

Watch your airspeed, altitude and rate-of-climb or you could stall and crash. If you deliver your supplies, you must then return over those mountains with a heavy cargo of gold bullion.

O'HARE—A control tower simulation in which you become an Air Traffic Controller. You are responsible for hundreds of human lives, as you guide the aircraft through your control sector to a safe landing.

You'll have to deal with different aircraft requirements, wind change warnings and potential midair collisions. But no matter what happens, you must bring in each of the 20 aircraft in your tour of duty.

PRECISION APPROACH RADAR—Combines the skills of pilot and Air Traffic Controller. You become the pilots' "eyes" as they try to land in limited visibility conditions. Your commands guide the aircraft in its approach to the field and a safe landing.

The flight path package involves you in both sides of flight procedure, from the thrill of flying to the tense drama of air traffic control. Model I, Level II, 16K; Model III, 16K.

0171R (Tape) \$9.95

THE FLYING CIRCUS

The Flying Circus package covers the full range of flying from old time biplanes to modern day air traffic control. These seven programs offer you the daring realism of flight:

AIR FLIGHT SIMULATION—Allows you to learn and practice the essentials of piloting.

NIGHT FLIGHT—A nighttime photo reconnaissance mission.

AIRMAIL PILOT—Return to the early days of aviation, where it's just you and your aircraft against the elements.

MOUNTAIN PILOT—Fly to a remote mining camp with desperately needed supplies.

O'HARE—Transforms you into an air traffic controller.

PRECISION APPROACH RADAR—Requires the skills of both an air traffic controller and a pilot.

JET FIGHTER PILOT—Takes you as close to real combat flying as possible... without pulling G's. You become the pilot of a twin turbo-jet, supersonic fighter. Total control of the aircraft is yours from takeoffs to landings to launching your missiles and destroying the target.

Your dream of flying becomes a reality with The Flying Circus package. Model I, Level II, 16K. Expansion Interface 16K & one disk drive.

0205RD (Disk) \$39.95

HOUSE OF THIRTY GABLES

Gold and treasures tempt us all, but only the stout of heart and swift of mind should attempt a trek through the legendary House of Thirty Gables. To be alert is to be successful against the strange array of creatures (and other terrors) waiting to end your quest for riches. Serpents and trolls are merely minor obstacles in this dungeon of mystery.

You make your way through these dank halls by typing two-word commands, such as GO WEST, READ SIGN, THROW AX, etc. You'll find various objects along your way—some of which you may need in order to solve the problems endemic to this enigmatic residence.

Let's you forget, there are heaps of treasure to be had for the adventurous and crafty explorer. However, the real reward is the pleasure you will have by outwitting the sinister inhabitants of the HOUSE OF THIRTY GABLES! Model I, Level II, 16K.

0219R (Tape) \$9.95

COSMIC PATROL

Skilled players soon master many difficult computer games, but COSMIC PATROL is in a world all its own. The challenge intensifies! Supporting graphics and sound (optional) make each encounter an exciting new experience. It all adds up to a Super 3-S package... Skill, Sight and Sound.

Scenario: The COSMIC PATROL program puts you in the command chair of a small interstellar patrol craft. Your mission is to defend Terran space and prey on the Quelon supply ships which carry essential parts and lubricants for that implacably hostile robotic force. The drone freighters are fairly easy pickings for the accomplished starship pilot, but beware of the I-Fighter escorts. They're armed, fast and piloted by intelligent robots linked to battle computers. They never miss.

The Cosmic Patrol program is not just another search and destroy game. With its fast, real-time action, impressive sound option and superb graphics, this machine-language program is the best of its genre.

Don't keep putting quarter after quarter into arcade games or spending big bucks for video game cartridges. Get COSMIC PATROL from Instant Software—and get the best for less! Tape version Model I, Level II, 16K; Model III, 16K. Disk version Model I, Level II, 16K.

0223R (Tape) \$14.95

0224RD (Disk) \$19.95

BATTLEGROUND

Here is a program that should interest you war-gamers:

It is late 1944, and the Allied Forces are sweeping toward Berlin. As General of your sector, you have at your command tanks, planes, artillery, infantry, engineers and vehicles—an awesome array of fighting men and the machines of war. From intelligence reports you know that the enemy General is a shrewd tactician, not to be underestimated. It will take planning and strategy to outwit this wily old campaigner.

The battle map of your sector will fill with markers, each showing the deployment of your forces. You and another player will slip into the roles of opposing German and American commanders as yet another battle unfolds. Battleground allows you to experience the total responsibility of a battle-area command. It will be up to you to deploy your forces. On your shoulders rests the decision whether to call for direct artillery gunfire or to order your planes into the air. You will constantly be watching for an enemy airdrop, always carefully maneuvering your Forces.

The stark reality of World War II comes alive in BATTLEGROUND. Model I, Level II, 16K; Model III, 16K.

0141R (Tape) \$9.95

NIGHT FLIGHT

Participate in one of the pivotal events of World War II—an awesome responsibility for you! Ready to tackle it?

It's May, 1941, the dreaded Axis battleship, the Bismarck, has broken out of the North Sea and is now somewhere in the North Atlantic. Your mission: make a nighttime photo reconnaissance flight over the Bismarck. You can help the Admiralty determine the extent of damage suffered by the Bismarck in a previous battle and whether the British fleet has a chance of sinking the German pocket battleship.

The Night Flight program lets you take off, fly and land a propeller-driven aircraft. Practice approaches and landings with a full on-screen display of the landing field information. The program will practically teach you to fly.

Somewhere out in the cold, gray North Atlantic, the Bismarck tries to elude her pursuers. Your photos are vital. Launch yourself into the night sky with the Night Flight package. Model I, Level II, 16K; Model III, 16K.

0117R (Tape) \$9.95

THE ALL STARS

Here's a collection of our best selling games... the ones you'll want to play again and again. It includes: SANTA PARAVIA AND FIUMACCIO—Become the ruler of a medieval city state as you struggle to create a kingdom. Up to six players can compete to see who will become the King or Queen.

OIL TYCOON—Avoid oil spills, blowouts and dry wells as you battle to become the world's richest oil tycoon. Two players become the owners of competing oil companies... and there's room for only ONE at the top!

PARADISE TRADER—You're the captain of a trading schooner, sailing the Caribbean in search of profits. As you sail from island to island, beware the dangers of the deep: pirates, ghost ships and hurricanes. Good sailing, skipper!

MILLIONAIRE—Here's \$1000. Can you turn it into a million dollars in fifteen (simulated) years? It depends on your strategy as you buy and sell properties, negotiate bank loans, collect rentals and accept sealed bids.

TIMBER BARON—An in-depth experience of the timber business, from dropping trees, until the milled lumber reaches the market. Your transactions are affected by those unexpected eventualities that can upset even the most careful plans.

BATTLEGROUND—European Theater, 1944: Your forces are sweeping toward Berlin. At your command are tanks, planes, artillery, infantry, engineers and vehicles. The battle map will fill with markers showing the development of your forces and the location of the enemy in one day of fighting. This two-player game will provide hours of entertainment. Model I, Level II, 16K, Expansion Interface + one disk drive.

0213RD (Disk) \$34.95

SANTA PARAVIA AND FIUMACCIO

Buon giorno, Signore!

Welcome to the province of Santa Paravia. As your steward, I hope you will enjoy your reign here. I feel sure that you will find it, shall we say, profitable.

Perhaps I should acquaint you with our little domain. It is not a wealthy area, Signore, but riches and glory are possible for one who is aware of political realities. These realities include your serfs. They constantly request more food from your grain reserves, grain that could instead be sold for gold florins. And should your justice become a trifle harsh, they will flee to other lands.

Yet another concern is the weather. If it is good, so is the harvest. But the rats may eat much of our surplus and we have had years of drought when famine threatened our population.

Certainly, the administration of a growing city-state will require tax revenues. And where better to gather such funds than the local marketplaces and mills? You may find it necessary to increase customs duties or tax the incomes of the merchants and nobles. Whatever you do, there will be far-reaching consequences... and, perhaps, an elevation of your noble title.

Your standing will surely be enhanced by building a new palace or a magnificent *cattedrale*. You will do well to increase your landholdings, if you also equip a few units of soldiers. There is, alas, no small need for soldiery here, for the unscrupulous Baron Peppone may invade you at any time.

To measure your progress, the official cartographer will draw you a *mappa*. From it, you can see how much land you hold, how much of it is under the plow and how adequate your defenses are. We are unique, in that here, the map IS the territory.

I trust that I have been of help, Signore. I look forward to the day when I may address you as His Royal Highness, King of Santa Paravia. Buona fortuna—or, as you say, "Good luck".

For Model I, Level II, 16K.

0043R (tape) \$9.95

PERFECT PONG

The last bastion of propriety has been breached. You, the staid, serious TRS-80 user are about to enter a world where no person can resist the lure, the excitement, the frenzy of the Arcade. Yes, you are about to meet—PERFECT PONG!

Instant Software presents Perfect Pong to add some zip and zest to your computer life. Enough of those math, bill paying and utility programs. It's time to add some fun to your life!

Perfect Pong is two programs offering nine different game boards and sound. Written in machine language, they are both fast and tricky. You control the paddles—but can you control your emotions in the middle of a rousing contest?

Why perpetuate the "stuffed shirt" image? Unleash the force of Perfect Pong and your computer will never be the same. Model I, Level II, 16K; Model III 16K.

0120R (Tape) \$14.95

Home and Personal Programs for your TRS-80

QSL MANAGER

Did you remember to send a QSL card to the op you worked last week? Maybe you sent a QSL, but can't recall getting one in return. The QSL Manager program will help you set up a computerized log book for instant access to your records.

Make complete log entries which include: date, time, call sign, name, band, both the Sent and Received signal reports, the mode, QSL sent/received, and any remarks you may want to add.

No more fumbling with index cards during a QSO, because the QSL Manager has a built-in search function to locate and display information on any call sign in your records. You can even list all the QSO's for a particular date, time, band worked, mode or a specific signal report.

The program will automatically check to see how much memory you have in your system. If you have a two disk, 32K system, you may have a maximum of 1000 entries in your log (500 entries if you have a single disk system). A 48K system limits you to 1400 entries.

These limits are caused by the fact that you have only 350 sectors on a disk. Each entry used 1/4 of a sector, thus the 1400 entry limit.

The program has built-in editing features that help you keep your log book up-to-date.

There's also a command that lets you output your log entries to a printer for hard copy.

In the next QSO, knock their socks off with your infallible memory. Model I, Level II, 16K, Expansion Interface + one disk drive.

0151RD (Disk) \$19.95

OIL TYCOON

What would it be like to be one of the world's biggest oil producers? You and your friends can find out with this action-packed simulation as you compete to become one of the oil industry's wealthiest tycoons.

Beginning with \$2 million, and armed with information from geologists' reports, you'll explore for new wells, exploit existing wells, and invest heavily in research and development in an effort to make your oil the most competitive available.

Once you have oil to sell, you can name your price—but don't get too greedy, or you'll find the demand for your product dwindling till the prices become more attractive.

The game involves elements of both strategy and chance. Whether you wind up as one of the world's wealthiest men, or the bankrupt victim of too many oil spills, blowouts, and dry wells, you're sure to find Oil Tycoon both challenging and exciting. Model I, Level II, 16K; Model III, 16K.

0023R (Tape) \$9.95

USER'S TIPS

Keep disk and tape cassettes away from magnetic fields (transformers, speakers, AC motors, magnets, etc.). Strong magnetic fields will destroy information on disks and tapes.

USER'S TIPS

When using a disk drive system, always power up peripherals (expansion interface, disk drives, printer, etc.) before you turn on the TRS-80 CPU/keyboard.

MUSIC MASTER

This quartet of programs lets you make beautiful music—or shall we say, YOUR kind of music.

MICRO ORGAN—A machine-language program that enables you to turn your TRS-80 into an electronic organ or harpsichord. You can choose from a range of four octaves and three voices.

KALIEDOPY—A combination kaleidoscope and player piano. Your computer creates a repeating pattern on the screen and then plays it as music. A special "messing around" section encourages you to modify and improvise the program.

COMPOSER—You generate "loose" or quasi-random music. You learn how to create music and how to control certain aspects of it. Also contains a "messing around" section.

KEYMANIA—It's Gametime! Up to four people can compete, as they try to remember and reproduce a random computer composition. It's a multi-level game, in which you set the tempo.

Bring harmony into your life with Music Master! Model I, Level II, 16K; Model III, 16K.

0084R (Tape) \$9.95

Games, and Simulations Entertainment for your APPLE

PADDLE FUN

This new Apple disk package requires a steady eye and a quick hand at the game paddle! We've included four different games to challenge and amuse you. They include:

INVADERS—You must destroy an invading fleet of 55 flying saucers while dodging the carpet of bombs they drop. Keep a wary eye for the mother ship directing the incursion. Your bomb shelters will help you—for a while! Our version of a well-known arcade game. Requires Applesoft in ROM.

HOWITZER—This is a one- or two-person game in which you must fire upon another howitzer position. This program is written in HIGH-RESOLUTION graphics, using different terrain and wind conditions each round, to make this a demanding game. The difficulty level can be altered to suit the ability of the players. Requires Applesoft in ROM.

SPACE WARS—This program has three parts: (1) two flying saucers meet in laser combat—for two players; (2) two saucers compete to see which can shoot out the most stars—for two players; and (3) one saucer shoots the stars in order to get a higher rank—for one player only. Requires Applesoft.

GOLF—Whether you win or lose, you're bound to have fun on our 18-hole Apple golf course. Choose your club and your direction and hope to avoid the sandtraps. Losing too many strokes in the water hazards? You can always increase your handicap. Get off the tee and onto the green with Apple Golf. One of its nicest features is you'll never need to cancel a golf date due to rain. Requires Applesoft.

The minimum system requirement for this package is an Apple II or Apple II Plus computer with 32K of memory and one minidisk drive.

Disk-based version.
0163AD (Disk) \$19.95

DOCTOR CHIPS

DR. CHIPS is a great icebreaker for cocktail parties. And if the need arose, he could entertain your early arriving guests while you finished dressing! Your friends will be asking you how the guy got into the computer.

Why shoulder the burdens of modern life in silence? Put your APPLE and DR. CHIPS to work today and get it all off your chest!

You'll need an Apple II (or II Plus), one disk drive, and 20K of RAM.

0254AD (Disk) \$14.95

MIMIC

How good is your memory? Here's a chance to find out! In MIMIC, your Apple will flash on the screen a sequence of figures on a 3 x 3 grid. You'll have to respond with exactly the same sequence. It sounds easy, but don't be fooled. There are five different, increasingly difficult versions of the game, including one that will keep going until you're ready to quit. MIMIC is exciting, fast-paced, and challenging—a fun game for family and friends. You'll need Integer BASIC and at least 24K of RAM.
0025A (Tape) \$9.95

APPLE FUN

We've taken five of our most popular programs and combined them into one tremendous package full of fun and excitement. This disk-based package now offers you these great games:

MIMIC—How good is your memory? Here's a chance to find out! Your Apple will display a sequence of figures on a 3 x 3 grid. You must respond with exactly the same sequence, within the time limit.

There are five different and increasingly difficult versions of the game, including one that will keep going indefinitely. MIMIC is exciting, fast-paced and challenging—fun for all!

AIR FLIGHT SIMULATION—Your mission is to take off and land your aircraft without crashing. You're flying blind, on instruments only.

You start with a full tank of fuel, which gives you a maximum range of approximately 50 miles. The computer will constantly display updates of your air speed, compass heading and altitude. Your most important instrument is the Angle of Ascent/Bank Indicator. It will tell if the plane is climbing or descending, whether banking into a right or left turn.

After you've acquired a few hours flying time, you can try flying a circuit against a map or doing acrobatic maneuvers. With a little more flight time under your belt, the sky's the limit!

COLORMASTER—Test your powers of deduction as you try to guess the secret color code in this Mastermind-type game. There are two levels of difficulty, and three options of play to vary your games. Not only can you guess the computer's color code, but it will guess yours! It will also serve as referee in a game between two human opponents. Can you make and break the color code?

STARSHIP ATTACK—Your mission is to protect our orbiting food station satellites from destruction by an enemy starship. You must capture, destroy or drive off the attacking ship. If you fail, our planet is doomed.

TRILOGY—This fascinating contest of logic has its origins in the simple game of tic-tac-toe. The object of the game is to place three of your colors in a row into the delta-like, multi-level display. The rows may be horizontal, vertical, diagonal and wrapped around, through the "third dimension". Your Apple (or human opponent) will be trying to do the same, and there are many paths to victory. You can even have your Apple play against itself!

Minimum system requirements are an Apple II or Apple II Plus computer with 32K of memory and one minidisk drive. MIMIC requires Applesoft in ROM, all others run in RAM or ROM Applesoft.
0161AD (Disk) \$19.95

GOLF

Without leaving the comfort of your chair, you can enjoy a computerized 18 holes of golf with a complete choice of clubs and shooting angles. You need never cancel because of rain. One or two players can enjoy this game on the Apple, with Applesoft II and 20K.
0018A (Tape) \$9.95

SKYBOMBERS II

Two countries, separated by The Big Green Mountain, are at war. Both nations are equipped with only one means of attack—SKYBOMBERS.

You and your opponent, each representing the nations at war, command opposing fleets of fighter-bombers armed with bombs and missiles. As enemy commanders, each of you has specific orders: Cross that mountain and bomb the enemy blockhouse into oblivion!

Flying over that innocent-looking mountain is not easy for either air force. The aircraft can fire missiles at each other; if that fails, they can ram each other. Sometimes, aircraft encounter falling bombs and are blown to pieces in flight. Desperate pilots can even crash into the enemy blockhouse.

Flight personnel are sometimes forced to parachute from badly damaged aircraft. As they float slowly to earth, they become helpless targets for the enemy to destroy in mid-air.

The sounds of battle are there to remind each commander of his grim responsibility.

Explosions are graphically displayed for both commanders. The scores for both countries are constantly updated at the bottom of the display screen.

Flying these missions develops into a gripping fascination. Air warfare becomes a vivid reality, as you both play the deadly game of Skybombers II.

Tape version requires 16K RAM & Applesoft or Integer Basic. Disk version requires 32K RAM & one disk drive. Both require an Apple II or Apple II plus and game paddles.

0183A (Tape) \$9.95

0271AD (Disk) \$19.95

SANTA PARAVIA AND FIUMACCIO

Buon giorno, Signore!

Welcome to the province of Santa Paravia. As your steward, I hope you will enjoy your reign here. I feel sure that you will find it, shall we say, profitable.

Perhaps I should acquaint you with our little domain. It is not a wealthy area, Signore, but riches and glory are possible for one who is aware of political realities. These realities include your serfs. They constantly request more food from your grain reserves, grain that could instead be sold for gold florins. And should your justice become a trifle harsh, they will flee to other lands.

Yet another concern is the weather. If it is good, so is the harvest. But the rats may eat much of our surplus and we have had years of drought when famine threatened our population.

Certainly, the administration of a growing city-state will require tax revenues. And where better to gather such funds than the local marketplaces and mills? You may find it necessary to increase customs duties or tax the incomes of the merchants and nobles. Whatever you do, there will be far-reaching consequences... and, perhaps, an elevation of your noble title.

Your standing will surely be enhanced by building a new palace or a magnificent *cattedrale*. You will do well to increase your landholdings, if you also equip a few units of soldiers. There is, alas, no small need for soldiery here, for the unscrupulous Baron Peppone may invade you at any time.

For the 48K Apple with Applesoft in ROM.

0174A (Tape) \$9.95

0229AD (Disk) \$19.95

AIR FLIGHT SIMULATION

Your aircraft is on the runway loaded with fuel, instruments feeding the computer a constant stream of information.

A glance at your flight screen gives you airspeed, altitude, and compass heading. After you take off, the all-important Ascent/Descent-Turn/Bank Indicator will tell you the attitude of your aircraft at a glance, whether you are climbing or diving, whether you are banking into a left or right turn.

Your mission is a short one. You have a maximum possible range of about 50 miles, on one precious tank of fuel. Your objective is to take off, fly the aircraft, and land without crashing.

Since you may not have been at the controls of an aircraft before, the basic flight instructions enclosed will be invaluable. Included are explanations on basic aerodynamics and principles of flight, plus illustrations telling you how to recover from dangerous maneuvers.

Your aircraft will respond rapidly to the controls, and your movements must be delicate. Too much airspeed and your aircraft could explode from overstress. If the airspeed is too slow, you might stall and crash. A clumsy turn, and you might find yourself flying upside down, fighting to regain control.

With Air Flight Simulation and enough flight time, the sky's the limit!

Requires 16K of RAM & Applesoft.

0148A (Tape) \$9.95

SAHARA WARRIORS

Now you can enjoy all the gritty realism of desert warfare with the Sahara Warriors package. **COMMANDO**—You must send your commands to trap a German general and cut him off from his troops. You'll have the choice of two levels of difficulty. **FRENCH FOREIGN LEGION**—The battalions of the French Foreign Legion are in a race with the Arabs. Which side will get its battalions into the oasis in the shortest time? You and a friend can find out. This game has four different versions, which even include an occasional sandstorm.

NOTE: Both programs in this package require an Apple with at least 8K and Integer BASIC. The French Foreign Legion program requires the use of game paddles.
0080A (Tape) \$9.95

OIL TYCOON

Could you be the world's wealthiest oil magnate? Find out with this action-packed simulation of real-world, cutthroat competition.

Beginning with two million dollars, and armed with the geologist's reports, you'll explore for new wells, exploit existing wells and invest heavily in research and development.

Once you have oil to sell, you can name your own price. Don't get too greedy, or the demand for your oil may dwindle until prices become more attractive.

When the game is over, you may find yourself the wealthiest tycoon around—or you may be the bankrupt victim of too many oil spills, blowouts and dry wells. No matter how you fare, you're sure to find Oil Tycoon both challenging and exciting on your Apple. Requires Applesoft in ROM, 16K.

0079A (Tape) \$9.95

for your HEATH

MENTAL GYMNASTICS

Put your mind against the challenge of these ancient games.

REVERSI—As you and a friend (or the computer) place your pieces on the board, you must each try to capture the opponent's pieces. The score can fluctuate wildly, and nobody can tell who'll win until the last move.

WARI—You can play a friend or the computer in this simple yet intriguing game. The two players take turns removing pieces from one cup and placing them in the other cups. As play continues, the number of pieces decreases. The last player who has a piece to move wins the game. To enjoy these ageless games, you'll need the Heath H-8 with 8K above Benton Harbor Extended BASIC.
0087B (Tape) \$9.95

Home/Personal for APPLE

SOLAR ENERGY FOR THE HOME

With the price of fuels rising to astronomical heights, solar space heating systems are starting to become very attractive. But, how do you know if a solar heating installation will be economically feasible? This program can answer that question.

All you do is supply the location, size, interior details and the amount of window space in your home. The program will calculate the current heat loss of your home and the amount of heat gained from any south-facing windows. Then, enter the data for the contemplated solar heating installation. The program will compute the net heating gain and give you the cost of using conventional fuels versus using solar heat. It will even calculate the pay-back period and show you if your contemplated investment in solar heating will save you money.

For anyone seriously considering the advantages and economics of a solar conversion, this package can provide practical guidance. For professionals designing and installing solar systems, it's a must.

Requires Applesoft BASIC, a single disk drive and a minimum of 28K of RAM.
0235AD (Disk) \$34.95

ASTROLOGY

Astrology is at once a science and an art. The heavenly bodies are believed to exert an influence upon the destinies of each individual—a destiny predetermined by a universal order resulting from (or coinciding with) the position of the planets in our solar system.

The astrological chart, or horoscope, is drawn as a map of the heavens at the exact time of a person's birth. A horoscope is an illustration of (1) the "planets" and their location within (2) the twelve signs of the Zodiacal Circle and (3) the twelve houses through which the heavenly bodies must pass. The sign which is in the ascendant (Eastern Horizon) at the time of birth is also of great significance.

This program draws your astrological chart using either the tropical or sidereal zodiac. After you enter your birth data in response to the on-screen prompts, your Apple will calculate and then display your individual horoscope. Once the horoscope has been cast, the program will list the angular relationships (aspects) of all of the "planets".

Note: This program makes no attempt to interpret the multitude of facts and relationships of a specific horoscope. For this information, we recommend that you consult a standard text on astrology or an experienced astrologer.

Knowledge of Astrology a necessity to use this program.

Minimum System: Apple II (or II Plus), one disk drive, 28K of RAM and Applesoft.
0242AD (Disk) \$19.95

for your NORTHSTAR

TRAFFIC ACCIDENT ANALYSIS AND RECONSTRUCTION

by Haim Reizes

Highway accidents, resulting in fatalities, injuries, and property damage, generally lead to prolonged litigation. The Traffic Accident Analysis and Reconstruction (TAAR) System will provide you with programs and analytical techniques to solve the equations involved in motor vehicle accidents. The System will present a reconstruction methodology utilizing physical evidence at the scene and a conclusive determination of the probable cause.

The purpose of this system is to provide accurate conclusions regarding the operational factors and dynamics contributing to highway accidents. The TAAR System

deals with the basic calculations of the common types of accidents and also explains and applies the various formulas of automobile kinematics.

The TAAR System is the result of Mr. Reizes' 25 years in the accident investigation field. These programs are invaluable to insurance casualty companies, accident investigators, plaintiff and defense attorneys, fleet safety directors, and police officials handling automobile accident cases.

This package requires the North Star Horizon II microcomputer with 48K of memory, two disk drives and the North Star Disk Operating System (DOS) version 5.0.

0173ND (Disk) \$499.95

Texas Instruments

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The year is AD 1400, and you are the ruler of a tiny Italian city-state. You are ambitious by nature and intend to build your little city-state into a powerful kingdom.

So begins Santa Paravia and Fiumaccio, where you and your fellow players compete as rulers of neighboring cities. You control the grain harvest, feed your people, set tax rates, exercise justice, and invest in public works.

Life was short back then, and you'll have only a limited amount of time in which to build your kingdom. The lives of your serfs will depend on your decision. If they are wise, then your city-state will grow and you will acquire loftier titles. If

your rule is incompetent, your people will starve and your city-state may be invaded by your neighbors.

You can play the game yourself or up to six players may compete at one time. Either way, you're sure to find your route to the throne a challenging road.

How will you rule your kingdom? Will you become unscrupulous and follow the example set by Niccolò Machiavelli in his book on government, *The Prince*—or will you be a benevolent ruler—an iron fist in a velvet glove? Only you can answer that question—with the Santa Paravia and Fiumaccio program. For TI99/4 Microcomputers.

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for your PET

CODE NAME: CIPHER

Now you can enjoy the feeling of intrigue with the CODE NAME: CIPHER software package. This enigmatic quartet of programs is a puzzle lover's delight. They include:

MEMORY GAME—The computer will shuffle a deck of cards and lay them out face down. You take turns choosing two cards and trying to match a pair. You can adjust the computer's "IQ" so that its memory is as fallible as yours.

CODEMASTER—One player types in a word, phrase or sentence and the PET translates it into a cryptogram. The other player must break the code and solve the cryptogram in the shortest time possible. The computer keeps score and will offer hints—but you lose points if you accept them.

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CODE BREAKER—Cracking this code won't be easy. The computer (or a human opponent) will enter a sequence of three, four or five secret symbols. You'll have to guess which symbols are used and their correct sequence. The fewer guesses, the higher your score. If you want to pit your wits against the relentless logic of the computer, then Code Name: Cipher is for you. Requires an 8K PET.

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The Chicago Sun

July 18, 1922

—WANTED—

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Let the Airmail Pilot package take you to the early days of aviation history. Your plane is the Curtis JN4-D, affectionately known as the Jenny. You must fly the mail from Columbus to Chicago.

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*"Those who seek the Holy Grail
Must fight and walk a tortuous trail.
Eleven monsters thou must fight,
Whilst searching through eternal
night."*

Count Stan of Santa Paravia
A.D. 1380-1402

Thus begins your quest in search of the Holy Grail, wherein you must descend through the twelve levels of the Dungeon of Death, find the Holy Grail, and return to the surface with it.

The Holy Grail is guarded by Smaug, the most fearsome monster of all, and ten lesser breeds of monsters. These gruesome beings will challenge you every step. You can only survive by using all the powers at your command.

You'll be able to cast magic spells, drink potions that may or may not help you, and open chests in search of gold or items that will help you fight the monsters.

Step softly in the darkness. Treasure or sudden death is only a footfall away in the Dungeon of Death! Requires an 8K PET.
0064P (Tape) \$9.95

QUBIC 4/GO MOKU

Play two ancient games on your modern PET. The two programs included are: **QUBIC 4**—Play a multi-dimensional game of tic-tac-toe.

GO-MOKU—Line up five of your men while blocking the PET's moves. These one player games require 8K of memory.

0038P (Tape) \$9.95

MIMIC

Test your memory and reflexes with the five different versions of this game. You must match the sequence and location of signals displayed by your PET. This one-player program includes optional sound effects with the PET. 8K.

0039P (Tape) \$9.95

SANTA PARAVIA AND FIUMACCIO

The year is AD 1400, and you are the ruler of a tiny Italian city-state. You are ambitious by nature and intend to build your little city-state into a powerful kingdom.

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The Jenny carries only 26 gallons of fuel. You'll have to stop along the way. Bad weather may force you down. Electrical storms may turn your aircraft into a mass of flaming wreckage, or it may form on your wings and plunge you to certain death below. But, the mail must get through.

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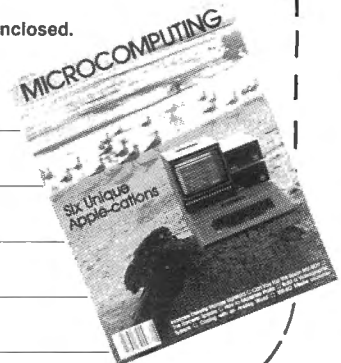
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31ABS

A compilation of wisdom on when and when not to compile.

A Macroprocessor For Basic—Part V

J. Alan Olmstead
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Engineering Systems
3843 West Street, Moritz Lane
Phoenix, AZ 85023

The MetaBasic compiler consists of three program modules. The first pools all literals; the second generates Assembly language source code from the MetaBasic commands; and the third posts public names (if any) to the external reference file. Prior to assembly, but just after all program modules in the group have been precompiled, the external reference generator uses this file to compute linkage addresses among all the various concurrent program modules.

Literal pooling is a feature common to nearly all compilers. Numbers, such as zero and one, are used continuously throughout the program as are certain character constants. Since their repetition consumes considerable space in main memory, the compiler sets them up once as a data constant and thereafter substitutes the compiler-generated name whenever the same literal appears again in the user's source code. The maximum length of a character literal is 48 bytes, and the maximum magnitude of a numeric literal is 99,999,999.99.

The generation of source Assembly language from the MetaBasic commands is actually the easiest part of the entire com-

pilation task. The generated code consists of a call followed by address definitions. The calls are to service routines contained within ZMonitor and are automatically defined as external to the user's program. The external reference generator will resolve them just prior to assembly.

If the Assembly language generator encounters DEFPUB annotation to any equate statement, the third compiler program is called automatically. It posts the name of the program module and the name which was declared to be public. The address is not computed at this time, however, on the presumption that changes to the program will be made. Similarly, if any reference is found to an external name, the program posts the module name as containing references needing to be resolved prior to assembly.

The Last Language: MetaBasic

MetaBasic is not merely an attempt to smooth out the simplification of general into detailed code, or to add new commands to the repertoire. It is an attempt to end the development of new languages and new extensions of old languages by making language itself a nonproprietary component of the computer. In simplest terms, the goal of MetaBasic is to make the construction of command words which do not exist possible, without modification of the compiler itself. In this sense, the command words resulting from the precompilation stages from interpreter Basic are only the JOFES suggested commands; they can be

changed at the user's will. No compiler can be all things to all users, and it is vaulting ambition to make such an attempt. To realize this goal, the very nature of compilation must be changed.

Changing Its Nature

Traditionally, a compiler searches an input source program file for recognizable command words. Finding them, the compiler creates an output file in a cycle of activities described as "This—Equals—That." As long as the compiler must search for recognizable command words in the source file, however, the compiler fails to meet the needs of some users.

Alternatively, consider a compilation process in which the compiler did not recognize command words but command syntax, or a sequence of symbols which collectively comprised a command. It could then consult a library of commands prepared by the user and, from the library, complete the compilation process. In this way, the user could revise and extend the compiler to adapt to the continuously changing hardware and applications environment of modern microcomputing. The capability might actually extend the life of an older model computer by several years, where it is serviceable except for its ability to be programmed in a new way.

Although the concept sounds exciting, there is a serious hitch in the rope that ties it all together. Making up new command sequences is easy; programming their long and detailed Assembly language service

"The solution is to recognize reality and open the hush-hush inner sanctum of the operating system."

subroutines is the work of a professional systems programmer. How does one Basic programmer, with little more than a beginner's introduction to Assembly language, make use of such a device? The solution is to recognize reality and open the hush-hush inner sanctum of the operating system.

A MetaBasic compiler works precisely because all the elemental Assembly language subroutines needed are already contained in the operating system and are available to the user through the Call command. There is a specific repertoire of such subroutines, documented in programming manuals and well known by systems programmers; they are the first subroutines programmed during the development of a new operating system. Those TRS-80 Model I users who have written disassemblers know where these TRSDOS subroutines are located and how to use them. The only difference introduced by JOFES' ZMonitor operating system is that this detective work has been obviated by publishing the information up front.

Given that essentially no Assembly language programming will be needed beyond the trivial to use the MetaBasic compiler, the modestly capable Basic/Assembly programmer may set up virtually any kind of high-level command he needs. The only restrictions include data formats and syntax.

Formatting both numeric and character data in memory is a picky and nasty business. After every step of program operation, the status of referenced data elements must be reviewed and updated where changed. Because of this, data formats are recognized and managed by the MetaBasic compiler. While limiting the general user in the same manner as traditional compilers, the trade-off given is freedom from a truly exasperating maintenance function.

The syntax problem is much simpler. The next few pages illustrate MetaBasic syntax by making up a new command and showing the library module which would be prepared for the compiler if the command were really used.

MetaBasic Syntax

The MetaBasic Compiler is actually not a compiler, but a "parsing macro processor." With very few exceptions, MetaBasic does not recognize command words. Instead, it analyzes or "parses" a command format before using the parsed elements to specialize a standard JOFES macro library module. The MetaBasic command line format is in Table 1.

The MetaBasic Compiler will process virtually anything which conforms to this format, in the following steps:

1. The MetaBasic line is read from the input file.

2. The line is determined to be a command line, or:
3. Comment or Assembly language line, the latter two being written directly to the output file.
4. Command line is parsed into its functional components and arranged in a macro call argument table in memory.
5. A final check is made for certain non-macro call elements.
6. The called macro is found in one of the macro libraries.
7. The macro lines are specialized from the command line arguments and written to the output file.
8. Return to step 1 until end of input file.

Before reviewing these steps in detail, it may be useful to examine a typical MetaBasic command line which is not available but for which a particular user has great need. His application consists, in this example, of retrieving a large number of customer accounts at random times in a large number of programs. He decides to invent the command: 1000 :FETCH ACCOUNT\$ FROM FILE\$ ON DRIVES\$. The command word is Fetch. ACCOUNT\$ is functional element one, From is element two, FILE\$ is element three, On is element four, and DRIVES\$ is element five. He might also have designed the command syntax: 1000:FETCH ACCOUNT\$ (FILE\$,DRIVES\$) in which case there would be only the command word and a single functional element ACCOUNT\$, associated with parenthetical modifiers. The analysis of these lines proceeds as follows:

● Step 1—Read Input: A MetaBasic input file is an ASCII-format sequential disk file. Each record is a line of the program. All characters between the first position and the first blank space on the line must be a number from 1-99999. If any character is not 0-9, and if the number is not terminated by a blank space, the line and the job will be aborted.

● Step 2—Determine Line Type: The first nonblank character after the first blank on the line must be one of three kinds: a colon (;) to signify a MetaBasic command line; a semi-colon (;) to signify an Assembly language comment line; or a capital letter (A-Z) to signify an Assembly language command. Macro call commands ('MACRO = NAME) are not permitted in the input file; such calls must be processed prior to compilation through MetaBasic. (The Precompiler, however, will permit macro calls without disturbing them.) Assembly language and comment lines are written directly to the output file. Unknown line types are flagged for a Bad Form message and converted into comments. Only the MetaBasic commands remain for subsequent processing.

● Step 4—Parse MetaBasic Command Line: the first nonblank character after the

colon begins the parsing process. Note that the position of the command elements is not as important as their sequence. For example, wherever a blank character appears any number of blanks may appear. The interpreter searches for the next nonblank character until the end of the line. The first nonblank character after the colon must be a capital letter; any other character will abort the line. This first character begins the command word, which continues until the next blank space. The command word may be any length, comprised of A-Z, or 0-9, and the special characters !, #, @, \$, %, & and period (.) and is terminated only by a blank space (any other character will cause an abort). All but the first six characters will be truncated from the word, and the remaining 1-6 characters will be examined for the exclusive values JP, CALL and RET. If a perfect match is found, the line will be converted into an Assembly language line and written to the output file. If those values appear in a larger sequence, however, they will not be recognized. For example, JPHERE, CALLME and RETURN will fail this examination.

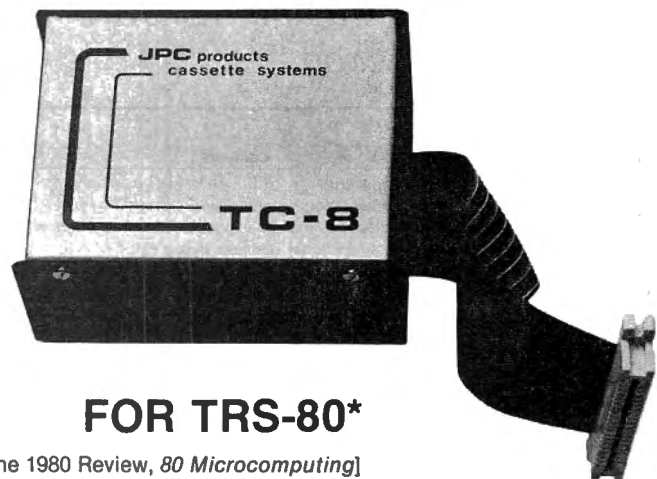
Returning to the blank space which terminated the command word, the compiler will search for the next nonblank character, which must also be a capital letter. This character signifies the beginning of the first functional element, the end of which is terminated by a blank space, a comma, or any of the symbols +, -, *, /, <, >, <=, =, =>, =, =>. In addition, a semicolon will terminate because it is the beginning of an in-line comment; a colon will terminate

Format Element	Description	Status
1	line number	required
2	blank space	required
3	colon	required
4	command word	required
5	blank space	required if not end
6	functional element 1	optional
7	terminator symbol	required if not end
8	functional element 2	optional
9	terminator symbol	required if not end
10	functional element 3	optional
11	terminator symbol	required if not end
12	functional element 4	optional
13	terminator symbol	required if not end
14	functional element 5	optional
15	terminator symbol	required if not end
16	functional element 6	optional
17	terminator symbol	required if not end
18	functional element 7	optional
19	terminator symbol	required if not end
20	functional element 8	optional
21	terminator symbol	required if not end
22	functional element 9	optional
23	terminator symbol	required if not end

Table 1. MetaBasic command line format.

Poor Man's Floppy

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JPC Products
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Kit: \$90
Assembled: \$120

by Carl A. Kollar

I guess I don't have to tell any TRS-80 owners how frustrating the cassette system that comes with the computer can be. Even with the factory mod that's available, the annoyance of loading and checking programs becomes just barely tolerable.

If you're like me, after you've just plunked down a chunk of money for a Level II 16K machine, "you ain't got nuttin left" for even one disk drive at 500 bucks apiece. So you suffer.

A reasonable alternative is the Exatron Stringy Floppy (ESF). This will cost you about 250 bucks and totally eliminates your loading and saving problems, automatically and fast. I've had one of these for about six months and love it!

But, if the price is still too steep, have I got a device for you!

The Device

The February 1980 issue of *Microcomputing* had an ad that intrigued the hell out of me. It was a high-speed cassette system by JPC Products acclaimed as a "poor man's floppy." It made all sorts of seemingly ridiculous claims such as "loads five times faster," "stores 50,000 bytes on a 10-minute cassette," "less than one bad load in a million bytes with the volume control anywhere between one and eight."

All this for a measly [90] bucks? How could this be? A call to Albuquerque answered a few questions: Yes, it had its own power supply, and, it stored programs five times faster because it utilized higher density data. The computer outputs the information at a higher rate out of the rear keyboard connector.

The ad had even claimed anyone could build it even if you have never soldered before. JPC would make it work, if you couldn't—for free. I was sold. I placed my order, and it arrived about two months later (parts shortage).

I work in electronics, so I found the unit exceptionally easy to build. It took about an hour. The manual is superb. (That's better than great.) It was clear, concise and exact with no

[Reprint of June 1980 Review, *80 Microcomputing*]

ambiguities. Important parts placements are stressed (polarity markings on electrolytics, bands on diodes, etc.).

JPC was right! With these instructions, you couldn't go wrong. The board quality is excellent. It is double-sided and parts locations are clearly marked on the component side of the board. There are no jumper wires to install. JPC utilizes PC traces and plated-through holes for connections to traces on the other side of the board.

Also, there are absolutely no adjustments or settings to bother with.

The documentation is a sheaf of 8½ × 11 papers stapled together. It is written in the nicest format I've seen in a while. Each command and/or subject is covered on its own sheet in large type. All explanations are in easy to read English—not computerese.

Commands and Features

SAVE“filename”: Saves your BASIC program on cassette.

LOAD: Reads the next BASIC program from the cassette.

LOAD“filename”: Searches for and loads the specified file from cassette.

LOAD? and LOAD?“filename”: Reads file from cassette, and compares contents to memory.

LOADN: Prints a list of all the programs on a cassette, until interrupted by the “break” key.

LOADN“filename”: Same as above except the tape will stop at the end of the program named.

KILL: Removes the file manager program from memory so that the extra memory can be used by large programs.

RSET: Allows the operator to rewind and position the tape on tape recorders that have these functions tied to the motor control jack.

RUN“filename”: TC-8 searches for a specified program and runs it immediately.

PUT“filename”: Same as SAVE “filename”, except it is for use with system tapes.

GET: Same as LOAD, except it is for use with system tapes.

GET“filename”: Same as LOAD “filename”, except it is for use with system tapes.

GET? and GET?“filename”: Same as LOAD? and LOAD?“filename”, except it is for use with system tapes.

GETN and GETN“filename”: Same as

LOADN and LOADN“filename”, except it is for use with system tapes.

OPEN: Required before cassette input or output of a data file can be attempted.

CLOSE: Required to end a cassette data file.

PRINT#: Allows numerical or string data to be output to a cassette file.

INPUT#: Allows numerical or string data to be input from a cassette file.

I haven't counted them, so I don't know about the “one load in a million bytes” claim, but my son, Anthony (age 11), loaded about 30 of his programs from his Radio Shack format tape to a new TC-8 format tape. He's run them all and found no bad loads.

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190

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“...JPHERE, CALLME and RETURN will fail this examination.”

Argument Number	Contents
1	command word
2	line number of source input file
3	nth time this command has been used in this program
4	number of functional elements in this call
5	
6	
7	
8	
9	
10	Functional element number 1
11	number of parenthetical subelements in this element
12	subelement number 1
13	subelement number 2
14	subelement number 3
15	subelement number 4
16	subelement number 5
17	subelement number 6
18	terminator symbol which ended this functional element
19	
20-29	Same as 10-19, for functional element number 2
30-39	Same as 10-19, for functional element number 3
40-49	Same as 10-19, for functional element number 4
50-59	Same as 10-19, for functional element number 5
60-69	Same as 10-19, for functional element number 6
70-79	Same as 10-19, for functional element number 7
80-89	Same as 10-19, for functional element number 8
90-99	Same as 10-19, for functional element number 9

Table 2. Macro call structure.

because MetaBasic allows only one command per line. The colon will be converted into a semicolon without comment or error. If a left parenthesis "(" is encountered while searching for the terminator symbol, the compiler will search only for a right parenthesis ")" before resuming search for the terminator symbol. The first functional element will be separated from its parenthetical unit (e.g., "ABS(A)", where "ABS" will be separated from "(A)", and the functional element will be truncated to six characters if it is longer. It will then be examined for an exclusive match against "EQU." If a match is found, the line will be converted into an Assembly language command and written directly to the output file.

If a parenthetical unit was found attached to the first functional element, it will be examined internally for one to six subelements. A parenthetical subelement may contain the same character range as the command word; multiple subelements must be separated only by a comma.

Returning to the symbol which terminated the first functional element, the compiler will search for the next nonblank character

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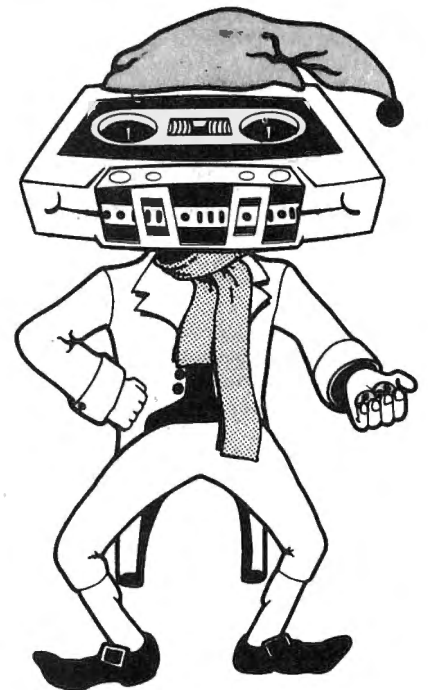
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“... an external name needs to be defined only once for the entire program.”

as the beginning of the second functional element. Its analysis will continue in the manner described above for the first functional element. There may be as many as nine functional elements.

The Macro Library

The internal macro call table is essential to implement compiler command lines. The macro library module providing the Assembly language used by the compiler must reference these syntactical elements; it does so according to the standard JOFES 99-argument macro call structure (Table 2).

Standard macro writing procedures, referencing these argument numbers, will include the correct Assembly language in the compiled program. For example, the MetaBasic command line, 1000: FETCH ACCOUNT\$(FILE\$,DRIVE\$) where ACCOUNT\$ is the functional element associated with two subelements FILE\$ and DRIVE\$, will be serviced by the macro library module:

```
1000 'MACRO = FETCH
1010 FT&&02 EQU $ ;LINE &&02
```

```
1020 'BOOL ((&&00)=(1))
1030 FETCH EQU 0000H;DEFEXT
1040 'ENDBOOL
1050 CALL FETCH
1060 'BOOL ((&&04)=(1))
1070 DEFW &&10
1080 'ENDBOOL
1090 'BOOL ((&&04)< >(1))
1100 ;*** ERROR IN ACCOUNT NAME ***
1110 'ENDBOOL
1120 'BOOL ((&&11)=(2))
1130 DEFW &&12
1140 DEFW &&13
1150 'ENDBOOL
1160 'BOOL ((&&11)< >(2))
1170 ;*** ERROR IN FILE NAME OR DRIVE
NUMBER ***
1180 'ENDBOOL
1190 'ENDMAC
```

The result of this command will generate the Assembly language.

The entry tag FT1000 was generated from argument two so the source-code programmer could refer to this routine by a constant name. The same information appears on the end of the line in a comment. Because this is the first time this macro has been called in this program, the external refer-

ence is generated at line 1010. In a second or successive call this line would be dropped out; an external name needs to be defined only once for the entire program. The address for the data variable ACCOUNT\$ has been truncated to the most significant six characters, "ACCOUN." Since the names of the file and drive were not longer than six characters, they were defined in their complete form. If the account name had been missing, or if either of the file name or drive number parameters had been missing, the appropriate error message would have been included in the program instead.

The program Fetch called in this sample has been assumed to be external to this program and, therefore, flagged with the DEFEXT indicator. If it were another macro called into this program in source form the macro programmer would not have included the DEFEXT comment on line 1030 of the macro module. Instead, a macro call to Fetch would appear elsewhere in the program, and the program would have passed through the Assembly language macro pro-

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“... the manufacturer who insists upon continuing to do every little thing for its customers will defeat its own purposes.”

cessor before compilation. This illustrates a major difference between macro processing in Basic and in Assembly language. The Basic macro processor recognizes common macros and calls them into the program only once during each specialization run. It also arranges the various macros at different locations of the program. By contrast, the MetaBasic Compiler includes every macro exactly where it is called, every time it is called. The macros intended to function as common within the Assembly program must be brought in expressly by the programmer; the Compiler could not otherwise know when a macro is intended to be internal or external.

A good way to become accustomed to writing Assembly language macros is to compile a small program, list it, and then list the macros in the macro libraries used during specialization. The names of the macros are the first six letters of each MetaBasic command word. Thus, Load is both a MetaBasic command word and the name of a macro library module.

Much of what is called “common sense”

is information acquired through noninstitutionalized education—just being around the subject and around other persons involved in that subject. Thirty years ago, there was no common sense surrounding the subject of computers. Today thousands of people have their own computers, get together in a variety of commercial and social contexts, and exchange their knowledge. The appearance of a body of “common sense” about computers is the hallmark of a maturing, socially integrated industry which will take a new shape and direction of its own, essentially beyond the control or influence of any manufacturer.

While it was formerly required that the computer hardware manufacturer provide a broad range of assistance devices in the software sphere because of the general lack of common sense in the user community, that is no longer true. Like a parent who cannot adjust to the maturity of his or her child, the manufacturer who insists upon continuing to do every little thing for its customers will defeat its own purposes. It is not unfair to state that the single greatest limi-

tation on the usefulness of microcomputers today, and those microcomputers in the TRS-80 Model I class in particular, is the limitation imposed by the “helpfulness” of the manufacturer.

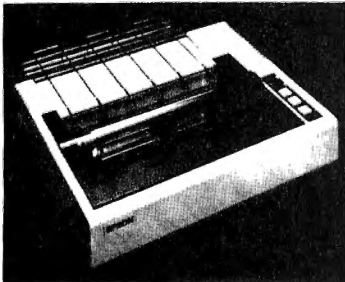
Optimal economies cannot be achieved by so many different kinds of users until the manufacturer—or some other source—provides tools which continue to help in a different way. The twenty-five-year-old “child” occasionally needs help, but not in the same way he needed help at age ten. The user community stands in this posture today as we seek optimized economies in the application of our microcomputers. We do not need to be told what to do and how to do it at every turn.

MetaBasic is one, perhaps the first, attempt to move into this new sphere of mature support for the microcomputer user. It will not be the final solution to this need. With another five years’ experience, the community as a whole will determine new and vastly improved devices for acquiring that support appropriate to contemporary economic need. ■

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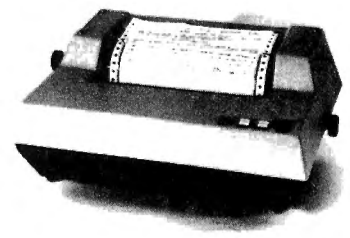
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For those of you who must edit and run.

Chain Command Implementation

Roger L. Pape
7545 Marble Drive
Liverpool, NY 13088

Have you ever wanted to change a program after spending much time entering variables? This article describes a program chaining that will allow you to edit programs and continue execution without

losing previously entered or calculated values.

The routines are designed primarily for cassette-based systems. The chain command is essentially equivalent to the CLOAD and run commands, including an optional file label character or starting statement number.

The procedure used to save variables while modifying source code in the current program is split into two function calls. The first call moves the variables to upper

memory and protects them. Then control returns to the command level. Use existing system commands to delete, insert or edit lines. After all modifications are made, a second function call restores the variables to their normal position and resumes execution at any point in the program. The second function should only be permitted if the variables had been moved earlier. Unique keywords should be defined for the three functions. The choice of Chain is obvious. For the command to protect variables before modifying the program, I selected Change. Restart was selected to denote the rerunning of the program.

Because the preserve-while-editing feature might be used at any time, these routines will remain in memory. Therefore, the package is as compact as possible and installed in protected high memory. Finally, this version is self-installing, relocatable below any other patches already loaded in upper memory.

Calling Convention

The standard system commands and functions are converted to single byte tokens when statements are entered. This process not only saves space, but also eliminates the time required to match strings of characters to a table of keywords when the program is executed. When additional commands are included, you should also use tokens, particularly if the commands are inserted in program statements. Otherwise, the character strings in each statement must be compared to the additional keywords as the statements are interpreted, slowing down execution time significantly. Unfortunately, though, almost all the possible 128 token values are used in the TRS-80 Level II software and there is no provision to extend the set with a second token byte.

Rather than add functions as separate commands, treat these functions as exten-

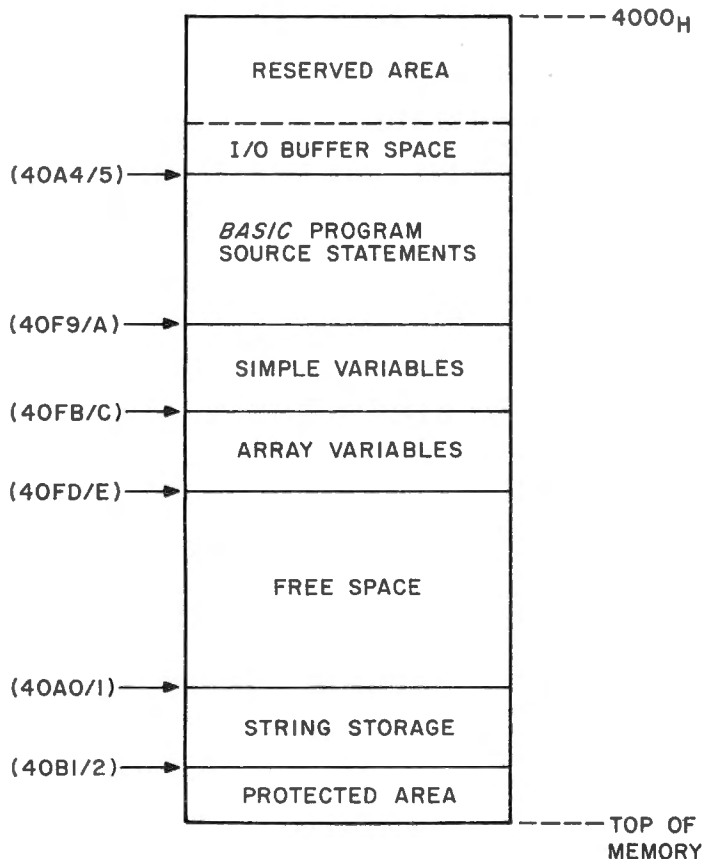


Fig. 1. RAM Memory Organization and Pointers in TRS-80 Level II.

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	CCA DATA MANAGER	AIDS III with CALLS	MAXI MANAGER	PADEX 10	PROFILE
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Maximum # of records per file	2450	Note 1	32,767	10,199	65,535
Maximum record length	249	254	800	255	255
Maximum # of characters per field	249	254	40	254	255
Maximum # of fields	24	20	20	127	153
Maximum # of characters per field label	15	10	19	12	765
Variable length records (pack sectors)	No	Note 2	Yes	No	No

FIELD TYPES

Alphanumeric	Yes	Yes	Yes	Yes	Yes
Numeric	Yes	Yes	Yes	Yes	No
Fixed decimal numeric	Note 4	Yes	Yes	No	No
Date (MM/DD/YY)	Yes	No	Yes	No	No
Extended date (MM/DD/YYYY)	No	No	Yes	No	No
Calculated equation	Note 5	Note 6	Yes	No	No
Permanent fields	Yes	No	No	No	No

SORTING

Machine language assisted	No	Yes	Yes	Note 7	Yes
Sort by any field	Yes	Yes	Yes		Yes
Number of Sort Key files	1	1	5		1
Numeric sort	Yes	Yes	Yes		No
Ascending sort	Yes	Yes	Yes		Yes
Descending sort	Yes	Yes	Note 11		Yes
Sort within a selected range	No	No	Yes		No
Sort multiple fields simultaneously	Yes	Yes	No		No

FILE MAINTENANCE

Fixed length input fields	Yes	Yes	Yes	Yes	Yes
Single key entry of common data	No	No	Yes	No	No
Single field EDIT selection	Yes	Yes	Yes	Yes	Yes
Skip record (next or previous)	Yes	Yes	Yes	No	Yes
Search & EDIT record	No	Yes	Yes	No	Yes
Search & DELETE record	No	Yes	Yes	No	No
Auto rejection of alphanumeric data in numeric field	Yes	No	Yes	No	No

RECORD SELECTION TECHNIQUES

Record number			Yes		
Binary search (high speed)			Yes		
Maximum # of simultaneous keys			10		

RELATIONAL COMPARISONS

Equal	No	Yes	Yes	Yes	Yes
Not equal	No	Yes	Yes	No	Yes
Greater than	No	Yes	Yes	Yes	Yes
Less than	No	Yes	Yes	Yes	Yes
Instring	Yes	No	Yes	Yes	No
AND / OR	No	No	Yes	Yes	No
Wild card masking	No	No	Yes	No	No

PRINTING

User specified page title	Note 8	No	Yes	No	Note 10
User specified column headings	No	No	Yes	No	Yes
Automatic page numbering	Yes	Yes	Yes	Yes	Yes
Right justification	No	Yes	Yes	No	No
User defined column widths	Yes	No	Yes	Yes	Yes
User defined column separators	No	No	Yes	No	No
Keyboard entered columnar values	No	No	Yes	No	No
Merge data into form letters	No	No	Yes	No	No
Form filling applications	No	No	Yes	No	No
Columnar totals	Yes	Yes	Yes	No	No
Columnar subtotals generated upon change in a specific field	Yes	Yes	Yes	No	No
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Built-in RS-232-C driver	Note 3	Note 3	Yes	Note 3	Note 3
Built-in TRS-232 driver	Note 3	Note 3	Yes	Note 3	Note 3
Programmer's interface	Note 9	Note 9	Yes	No	Note 9
Sample DATA disk	No	No	Yes	No	No
Documentation (# of pages)	?	?	120	38	29

NOTE 1: File size is dependent on memory size.
 NOTE 2: Sequential files only.
 NOTE 3: User must apply own driver routine.
 NOTE 4: Hard copy print out only.
 NOTE 5: Four functions (o- /) only.
 NOTE 6: Same as note 4 with a maximum of two calculated fields.
 NOTE 7: Available as a separate program for \$99.95.
 NOTE 8: 120 character maximum.
 NOTE 9: Data structures defined in manual.
 NOTE 10: 132 characters maximum.
 NOTE 11: User option (files can be read from ascending or descending order).

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"The routines are designed primarily for cassette-based systems."

sions of an existing command. Certain commands include "hooks" in the reserved RAM area to provide for changes. At some point in the processing of these commands, program execution jumps to the RAM area. The default code stored there at power-up is simply a Return instruction. However, it can be modified to a jump that transfers execution to an area where the extensions have been loaded. One of the modifiable commands is Run. Therefore, it was decided to invoke the functions with Run Chain, Run Change, and Run Restart as the form of the commands. The patch will be entered only when a Run command is being processed,

not as each line of code is interpreted.

Description of Routine

To obtain the compactness of Program Listing 1, I used existing Level II system routines and pointers stored in the reserved area. All the code to be installed is "position independent" so that it can be automatically relocated below existing routines. Returns to the system assume Level II (cassette-based) operation. Modifications would be required to operate with a DOS.

Code to Install Patch

The first portion of Program Listing 1

simply assigns labels to the various entry points in ROM and the storage locations in the reserved area where values and pointers needed in the routines can be found. Lines 440 to 610 are used only when first loaded to move the routines up into the highest available memory space, install the vectors to the patches and set the memory size pointer to protect the relocated routines. The installation code is not protected, so it will be overwritten later by the string storage. The value in the ORG statement is arbitrary. It may be any convenient starting point in memory where the machine code can be stored temporarily as it is loaded from tape.

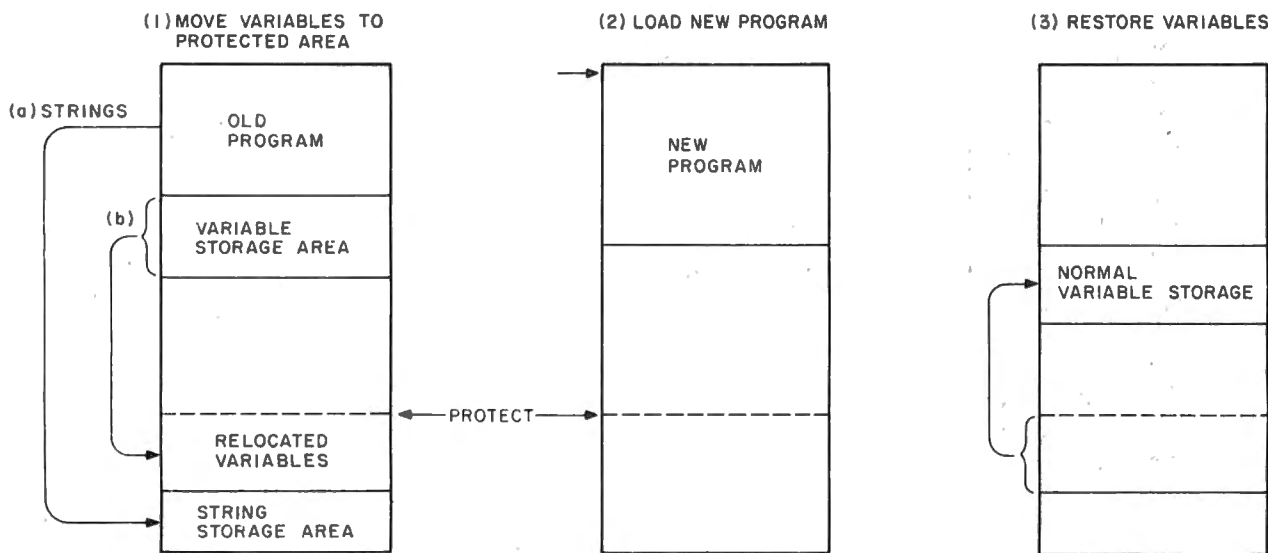


Fig. 2. Chain Sequence

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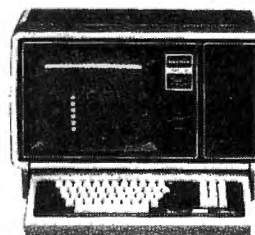


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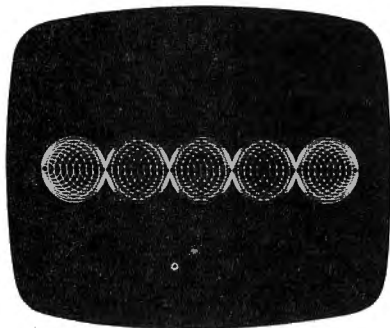
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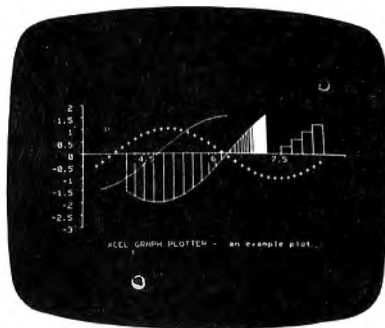


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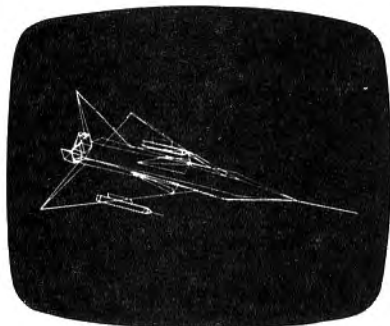
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“... any absolute memory reference to the table must be avoided if the code is to be relocatable...”

After moving the stack pointer temporarily to the I/O buffer area, the routine points the HL register pair to the end of the code as loaded from tape and points DE to the last available memory location as determined from the value stored in the reserved area. It then performs a block transfer from the end to the start. Jump instructions are then loaded into the appropriate reserved area locations to provide for the Run command extension and to intercept the return from the CLOAD routine. Finally, the value of the first location of the code that was just installed is again loaded into HL before returning to the system software in ROM.

This re-entry point corresponds to the code following the memory size dialog, so the value in HL is decremented and stored as the new memory protect value. The string storage area and stack are also relocated below this point. This is a convenient technique that can be used when any machine language routine is loaded in high memory. Simply load the address of the lowest location to be protected into HL and jump to 00E7H when returning to Basic. This will automatically protect the routine and relieve the user of having to remember what memory size value to enter.

Scanning a Keyword Table

The remaining part of the code in Listing 1 represents the routine that remains resident in protected memory. Lines 630 to 880 check the characters following Run for the new keywords used in this patch. Although the table of new keywords is stored within this portion of code, any absolute memory

reference to the table must be avoided if the code is to be relocatable in any area of memory *without modification*.

This feat is accomplished by the Call Get-PC statement. A short routine in ROM is called which simply POPs the return address from the stack into HL and jumps back, so that HL contains the address following the call statement on return.

The keyword table is set up in the same way as the Basic keyword table in ROM. The first character of each keyword has its most significant bit set. After the last word, a value of 80H is used to terminate the table. By defining the keyword in this manner, we can use the same routine in ROM that is used to scan incoming statements for Basic keywords. This system routine attempts to match the character string pointed to by HL to the keywords in a table pointed to by DE. If a match is found, a value is returned in both the B and C registers which corresponds to the index of the keyword in the table plus 80H. A value of 80H is returned if Chain is found, 81H for Change, or 82H for Restart. If no match is found, we can exit from the patch.

When a keyword match occurs, the pointer to the remaining characters of the line must be saved for later, in case a file name and/or line number is included in the command. When Restart is encountered, check to make sure that a Change command had been issued earlier. If not, the command is invalid and is ignored.

Moving the Variables

Lines 890 through 1360 are common to

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“... some string variables may be located within the Basic statement storage area.”

the processing of both the Chain and Change commands. After saving the current token, this section moves all variables to the upper portion of memory and protects them. Remember that some string variables may be located within the Basic statement storage area. These must be moved to the string storage area; otherwise they will be lost when new statements are loaded or the memory references will be incorrect if statements are moved in the editing process. Fortunately, there is a system routine in ROM (part of the FRE command processing) which packs the string storage area before reporting the remaining space available. Normally, this routine would only operate on strings in the string storage area. However, we can also pull strings out of the Basic statement area simply by changing the beginning location for the scan to the start of the Basic statements before the packing routine is called.

The code given in Listing 1 does not check to ensure that the other variable area is not overwritten as the strings are moved. This could be a problem if a lot of strings are

Program Listing 1. Assembly Language Routine for Chain.

```

00110 ;          COPYRIGHT (C) 1979
00120 ;          R. L. PAPE   LIVERPOOL, NY   SEPT. 1979
00130 ;
00140 GETPC  EQU 000BH          ;ENTRY FOR ROUTINE TO GET PROGRAM CO
000B UNTER          00150 MEMSET EQU 00E7H          ;REENTRY POINT IN LVL II TO SET MEMO
00E7 RY LIMIT
1A19 00160 RESTRT EQU 1A19H          ;RESTART POINT FOR LEVEL II BASIC
1B8F 00170 INITM  EQU 1B8FH          ;ENTRY FOR INITIALIZATION ROUTINE
1BFE 00180 KWSRCH EQU 1BFEH          ;ENTRY FOR KEYWORD SEARCH ROUTINE
1D1E 00190 XEQ    EQU 1D1EH          ;RETURN POINT TO START PROGRAM
1D91 00200 RESTOR EQU 1D91H          ;ENTRY FOR DATA RESTORE ROUTINE
1EAC 00210 RUNLN  EQU 1EACH          ;ENTRY FOR RUN WITH LINE NUMBER
28E6 00220 STRPK  EQU 28E6H          ;ENTRY FOR STRING PACKING ROUTINE
2C1F 00230 CLOAD  EQU 2C1FH          ;ENTRY FOR CLOAD ROUTINE
00240 ;
40A8 00250 SSTR   EQU 40A0H          ;RESERVED LOC FOR START OF STRING SP
ACE
40A2 00260 LNNUM  EQU 40A2H          ;RESERVED LOC FOR CURRENT LINE NUMBE
R
40A4 00270 SSTR   EQU 40A4H          ;RESERVED LOC FOR START OF BASIC SOU
RCE
40B1 00280 MEMLIM EQU 40B1H          ;RESERVED LOC FOR MEMORY PROTECT POI
NTER
40D1 00290 LSTKN  EQU 40D1H          ;UNUSED LOC FOR SAVING TOKEN
40D6 00300 CSPTR  EQU 40D6H          ;RESERVED LOC FOR CURRENT STRING STO
RAGE POINTER
40D8 00310 INPTR  EQU 40D8H          ;RESERVED LOC FOR INPUT POINTER
40DF 00320 SADDR  EQU 40DFH          ;RESERVED LOC FOR START ADDRESS
40F9 00330 SVAR   EQU 40F9H          ;RESERVED LOC FOR START OF VARIABLE
STORAGE
40FB 00340 SARR   EQU 40FBH          ;RESERVED LOC FOR START OF ARRAY STO
RAGE
40FD 00350 SFRE   EQU 40FDH          ;RESERVED LOC FOR START OF FREE SPAC
E
41B5 00360 ;
41C7 00370 CLDHK  EQU 41B5H          ;HOOK FOR CLOAD RETURN
42E8 00380 RUNHK  EQU 41C7H          ;HOOK FOR RUN XXXX COMMAND
A) 00390 TMPSTK  EQU 42E8H          ;TEMP STACK START (IN I/O BUFFER ARE
00400 ;
00410 ;          FOLLOWING SECTION INSTALLS MOD IN HIGHEST AVAILABLE MEM
ORY SPACE
00420 ;          AND AUTOMATICALLY PROTECTS ITSELF
00430 ;
6000 00440          ORG 6000H          ;SET ORIGIN TO ANY CONVENIENT FREE M
EMORY
6000 31E842 00450 SETUP LD SP,TMPSTK          ;SET STACK IN I/O BUFFER SPA
CE TEMP
6003 210661 00460          LD HL,XIT+2          ;LOAD HL WITH CURRENT ADDR O
F LAST BYTE
6006 ED5BB140 00470          LD DE,(MEMLIM)          ;LOAD DE WITH ADDR OF LAST A
VAILABLE LOC
600A 01DF00 00480          LD BC,XIT-RUNX+3          ;PUT LENGTH IN BC
600D EDB8 00490          LDDR          ;MOVE CODE
600F EB 00500          EX DE,HL
6010 23 00510          INC HL          ;HL NOW POINTS TO START OF R
ELOC CODE
6011 E5 00520          PUSH HL          ;SAVE FOR LATER
6012 3EC3 00530          LD A,0C3H          ;JP INSTRUCTION CODE
6014 32C741 00540          LD (RUNHK),A          ;HOOK FOR RUN COMMAND EXTENS
ION
6017 22C841 00550          LD (RUNHK+1),HL
601A 019200 00560          LD BC,CLRTN-RUNX          ;OFFSET
601D 09 00570          ADD HL,BC          ; TO POINT HL TO CLRTN
601E 32B541 00580          LD (CLDHK),A          ;HOOK TO INTERCEPT CLOAD RET
URN
6021 22B641 00590          LD (CLDHK+1),HL
6024 E1 00600          POP HL          ;RESET HL TO START OF CODE T
O PROTECT
6025 C3E700 00610          JP MEMSET          ;REENTER LVL II, SETTING MEM
ORY LIMIT
00620 ;
6028 EB 00630 RUNX  EX DE,HL          ;SAVE INPUT STRING POINTER I
N DE
6029 CD0B00 00640          CALL GETPC          ;HL WILL POINT 2 LOC BEFORE
TABLE BELOW
602C 1813 00650          JR SCAN          ;SKIP OVER TABLE
602E C3 00660 KWTBL  DEFB 0C3H          ;1ST CHAR OF KEYWORD HAS MSB
SET
602F 48 00670          DEFM 'HAIN'          ;REST OF KEYWORD
6033 C3 00680          DEFB 0C3H          ;2ND KEYWORD
6034 48 00690          DEFM 'HANGE'          ;
6039 D2 00700          DEFB 0D2H          ;3RD KEYWORD
603A 45 00710          DEFM 'ESTART'          ;
6040 80 00720          DEFB 80H          ;TABLE TERMINATOR
6041 23 00730 SCAN  INC HL          ;
6042 EB 00740          EX DE,HL          ;SWAP POINTERS FOR NEXT ROUT
INE
6043 CDPE1B 00750          CALL KWSRCH          ;CHECK FOR KEYWORD MATCH
6046 EB 00760          EX DE,HL          ;PUT STRING POINTER BACK IN
HL
6047 78 00770          LD A,B          ;PUT TOKEN FROM SCAN IN A

```

Program continues

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“...one can then POP off the memory protect value and the block lengths.”

moved from a program which nearly fills memory. After the strings have been packed, the routine checks to see if the lower limit of the string space must be moved down.

The variable storage area can now be moved up immediately below the string area. Although the entire area can be moved as a block, the offset to the start of the array variables must also be computed in addition to the total length. The simplest way to save these lengths is to locate the stack immediately below the temporary variable storage and push the two values on the stack, along with the old memory protect pointer. The value of the stack pointer is then stored as the new memory size value.

If the command was Run Change, we have completed the necessary steps at this point. If the current token indicated Change, exit from the patch back to the command mode in Basic. The only other command that would have brought us to this point is Chain. Before jumping to the tape loading routine (CLOAD), the string pointer in the line being interpreted is restored in case a filename character is included in the Chain command.

Returning from CLOAD

The return from the CLOAD routine is intercepted at lines 1380 to 1430 because of the hook installed when the patch was initialized. The section will also be entered when a normal CLOAD command is issued (as well as the continuation of the Chain command). The first thing that must be done at this point is to check the current token. If it does not correspond to Chain, the patch is exited immediately. Otherwise, the string pointer is again saved in case a line number is included in the Chain command.

Restoring the Variables

Lines 1440 to 1640 move the variable block from upper memory back to its normal position immediately following the end of the new program statements. This is done automatically as part of the Chain command processing or is initiated by the Restart command after completing the statement editing (following a Change command). The steps performed in this section are essentially the reverse of those when the variable block is moved to upper memory and protected. By setting the stack pointer to the bottom of the protected area, one can then POP off the memory protect value and the block lengths.

A block transfer instruction moves the variables back. At the end of the transfer, the DE register pair will point to the start of free space, so its value is stored in the cor-

Program continued

```

6048 B9      00780      CP C                ;B AND C SAME IF MATCH
6049 C0      00790      RET NZ             ;RETURN IF NO MATCH
604A 23      00800      INC HL            ;SKIP PAST LAST CHAR MATCHED

604B 22DF40  00810      LD (SADDR),HL    ;SAVE STRING POINTER
604E 21D140  00820      LD HL,LSTKN      ;POINT HL TO TOKEN STORAGE
6051 FE82    00830      CP 02H           ;CHECK IF CURRENT TOKEN IS R
EPEAT
6053 2005    00840      JR NZ,SVTKN      ;IF NOT, SKIP OVER FOLLOWING
6055 96      00850      SUB (HL)         ;CHECK IF CHANGE COMMAND EAR
LIER
6056 3D      00860      DEC A            ;IF SO, DIFFERENCE IS 1
6057 2870    00870      JR Z,UNPK        ;CONTINUE BELOW
6059 C9      00880      RET              ;ELSE RETURN
605A 77      00890      LD (HL),A        ;SAVE TOKEN
605B 21E842  00900      LD HL,TMPSTK     ;RELOCATE STACK
605E F9      00910      LD SP,HL         ;GET START OF STRING STORE A
605F 2AA040  00920      LD HL,(SSTR)     ; AND SAVE
REA
6062 E5      00930      PUSH HL          ;REPLACE WITH START OF BASIC
6063 2AA440  00940      LD HL,(SSRC)
SOURCE
6066 22A040  00950      LD (SSTR),HL    ;PACK ALL STRINGS AT TOP OF
6069 CDE620  00960      CALL STRPK
MEMORY
606C 2AD640  00970      LD HL,(CSPTR)   ;GET BOTTOM OF PACKED STRING
S
606F EB      00980      EX DE,HL        ;GET ORIG STRING STORAGE STA
6070 E1      00990      POP HL
RT
6071 DF      01000      RST 18H         ;COMPARE VALUES

```

Program continues

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"Once installed, the routine remains resident in protected high memory."

Program continued

```

6072 3801    01016    JR C,RSSTR          ;IF CARRY, HL IS LOWER
6074 EB     01020    EX DE,HL           ;ELSE SWAP WITH DE
6075 22A040 01030 RSSTR LD (SSTR),HL        ;RESET STRING STORAGE START
TO LOWER VAL
6078 ED5DF940 01040    LD DE,(SVAR)      ;GET START OF VARIABLE STORA
GE
607C 2AFD40 01050    LD HL,(SPRE)     ;GET START OF FREE SPACE
607F E7     01060    OR A              ;CLEAR CARRY FLAG
6080 ED52   01070    SBC HL,DE        ;CALC SIZE OF TOTAL VARIABLE
SPACE
6082 44     01080    LD B,H           ;TRANSFER SIZE TO BC
6083 4D     01090    LD C,L           ;GET START OF STRING SPACE
6084 2AA040 01100    LD HL,(SSTR)    ;CALC START FOR RELOCATED VA
OR A
6087 B7     01110    OR A              ;RELOCATE STACK BELOW BLOCK
6088 ED42   01120    SBC HL,BC        ;SAVE POINTER DURING NEXT CA
RIABLES
608A F9     01130    LD SP,HL         ;GET START OF ARRAY STORAGE
608B E5     01140    PUSH HL          ;SAVE POINTER DURING NEXT CA
LC
608C 2AFB40 01150    LD HL,(SARR)    ;GET START OF ARRAY STORAGE
608F E7     01160    OR A              ;CALCULATE OFFSET FROM START
6090 ED52   01170    SBC HL,DE        ;PLACE ON STACK, RESTORING P
OF VARIABLES
6092 E3     01180    EX (SP),HL      ;ALSO SAVE TOTAL LENGTH OF V
OINTER IN HL
6093 C5     01190    PUSH BC          ;TEST CONTENTS OF BC (BYTE C
ARIABLES
6094 78     01200    LD A,B           ;SKIP BLOCK TRANSFER IF ZERO
OUNT)
6095 B1     01210    OR C              ;SWAP POINTERS FOR NEXT INST
6096 2803   01220    JR Z,SVML       ;RELOCATE BLOCK OF VARIABLES
R
6098 EB     01230    EX DE,HL         ;GET OLD MEMORY PROTECT POIN
6099 EDB0   01240    LDIR             ;SAVE ON STACK
TER
609B 2AB140 01250 SVML LD HL,(MEM LIM)  ;GET CURRENT STACK POINTER V
609E E5     01260    PUSH HL          ;PROTECT ALL ABOVE
609F 210000 01270    LD HL,0000H     ;ALSO RESET STRING SPACE STA
60A2 39     01280    ADD HL,SP        ;CHECK TOKEN AGAIN
ALUE
60A3 22B140 01290    LD (MEM LIM),HL ;IF CHANGE COMMAND, DONE; RE
60A6 22A040 01300    LD (SSTR),HL    ;RESTORE STRING POINTER IN H
RT HERE TEMP
60A9 3AD140 01310    LD A,(LSTRN)    ;CHECK TOKEN AGAIN
60AC FE81   01320    CP 81H          ;IF CHANGE COMMAND, DONE; RE
60AE CA191A 01330    JP Z,RESTRT     ;RESTORE STRING POINTER IN H
ENTER BASIC
60B1 2ADF40 01340    LD HL,(SADDR)

```

Program continues

responding reserved area locations. The HL register pair will be pointing to the start of the string storage space and the stack is re-located there. Finally, the start of the array storage is computed and saved.

Starting the Program

Lines 1650 to 1730 perform the necessary initialization before program execution and reenter the ROM after the point where the variable storage pointers are reset. In this way the current variables in the storage area are preserved. The line number stored in the reserved area is reset to -1 (FFFFH). If no line number is specified in the command string, execution will start at the beginning of the program. But if there are more characters in the command string (as determined by the RST 10H instruction), they are assumed to be the line number at which to enter the program. The alternate return in this case is the point at which the GOTO statement processing interprets the line number.

Therefore, we have provided the option of specifying a starting line number or starting at the beginning of the program by default if no line number is given.

Using the Routine

After the routine is assembled and saved, it can be loaded after any other patches, such as a keyboard debounce or special device driver, have been installed. The setup portion must then be run (by typing a / and Enter after loading) in order to install the routine. Once installed, the routine remains resident in protected high memory. The

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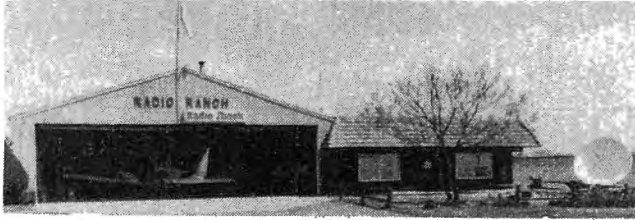
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"If Basic encounters a syntax error during program execution, it will automatically put you in the Edit mode."

added commands can then be called at any time as needed.

To chain from one program to another, any of the following forms may be used:

```
RUN CHAIN
RUN CHAIN "f"
RUN CHAIN "f" 1n
```

where f is the filename character used to save the program on tape
1n is a valid line number

In the first case, the next program on tape is loaded and execution will start at the beginning of the program. In the second case, the specified program will be loaded (if found) and will start from the beginning. In the third case, the named program will be loaded and entered at the specified line number. (If a starting line number is given, the filename character *must* be included.) Any of these Chain commands can be included as a statement in the first program. As the Chain routine is executed, it will be typed out Ready when the second program has been loaded and automatically start this new program.

In order to preserve the values of variables while a program is being modified, two separate commands are used. Before any editing, one must first type Run Change to protect the current values. This routine moves all variables to upper memory, protects them, and returns control to the command level of Basic. Then use any of the standard system commands to change the program statements, or use Edit to modify

Program continued

L					
60B4	22DB40	01350	LD (INPTR),HL		;RESAVE IN LOC USED BY CLOAD
60B7	C31F2C	01360	JP CLOAD		;JUMP TO CLOAD ROUTINE
60BA	21D140	01360	CLRTN LD HL,LSTKN		;NORMAL COMMANDS ENTER HERE
ALSO					
60BD	7E	01390	LD A,(HL)		;CHECK TOKEN STORAGE
60BE	FE80	01400	CP 80H		;IF CHAIN, CONTINUING FROM A
BOVE					
60C0	C0	01410	RET NZ		;ELSE RETURN
60C1	ED5BD840	01420	LD DE,(INPTR)		;TRANSFER STRING POINTER
60C5	ED53DF40	01430	LD (SADDR),DE		;TO OTHER STORAGE LOCATION
60C9	AF	01440	UNPK XOR A		
60CA	77	01450	LD (HL),A		;CLEAR FLAG
60CB	2AB140	01460	LD HL,(MEMLIM)		
60CE	F9	01470	LD SP,HL		;PUT STACK AT BOTTOM OF PROT
ECTED AREA					
60CF	E1	01480	POP HL		;RESTORE
60D0	22B140	01490	LD (MEMLIM),HL		; OLD MEMORY PROTECT POINTE
R					
60D3	210400	01500	LD HL,0004H		
60D6	39	01510	ADD HL,SP		;HL POINTS TO START OF RELOC
VARIABLES					
60D7	ED5BF940	01520	LD DE,(SVAR)		;GET END OF NEW PROGRAM
60DB	C1	01530	POP BC		;GET LENGTH OF VARIABLE BLOC
K					
60DC	78	01540	LD A,B		;CHECK BYTE COUNT
60DD	B1	01550	OR C		
60DE	2802	01560	JR Z,RSTPT		;SKIP TRANSFER IF ZERO
60E0	EDB0	01570	LDIR		
60E2	C1	01580	RSTPT POP BC		;GET OFFSET TO ARRAYS
60E3	ED53FD40	01590	LD (SFRE),DE		;DE POINTS TO START OF FREE
SPACE, STORE					
60E7	22A040	01600	LD (SSTR),HL		;HL POINTS TO STRING SPACE,
RESET POINTER					
60EA	F9	01610	LD SP,HL		;ALSO RESET STACK THERE
60EB	2AF940	01620	LD HL,(SVAR)		;CALCULATING
60EE	09	01630	ADD HL,BC		; START OF ARRAYS
60EF	22FB40	01640	LD (SARR),HL		;STORE
60F2	21FFFF	01650	LD HL,0FFFFH		
60F5	22A240	01660	LD (LNNUM),HL		;RESET LINE NUMBER
60F8	CD8F1B	01670	CALL INITM		;MORE INITIALIZATION
60FB	CD911D	01680	CALL RESTOR		;RESTORE DATA READ POINTER
60FE	2B	01690	DEC HL		
60FF	D7	01700	RST 10H		;GET NEXT CHAR FROM INPUT ST
RING AND TEST					
6100	C2AC1E	01710	JP NZ,RUNLN		;IF MORE, MAY BE LINE NUMBER
6103	EB	01720	EX DE,HL		;ELSE POINT HL TO START OF P
ROGRAM					
6104	C31E1D	01730	XIT JP XEQ		;AND START EXECUTION
6000		01740	END SETUP		

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

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

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“... one can often segment a very large program into a sequence of modules which will fit in a modest sized machine.”

```

>LIST
10 X=1:Y=10:Z=999
20 A$="THIS IS A TEST OF CHAIN"
READY
>RUN
READY
>RUN CHAIN
READY
STARTING NEW PROGRAM
THIS IS A TEST OF CHAIN
1 10 999
READY
>

>LIST
10 X=1:Y=10:Z=999
20 A$="THIS IS A TEST OF CHAIN"
READY
>RUN
READY
>RUN CHAIN"B" 30
READY
1 10 999
READY
>LIST
10 PRINT"STARTING NEW PROGRAM"
20 PRINT A$
30 PRINT X,Y,Z
READY
>

```

Program Listing 2. Examples of Chain Command Usage.

existing lines. Then restore the variables and start the program with the following command:

```
RUN RESTART 1n
```

1n is the line number at which to resume program execution. If no line number is entered, it will restart at the beginning by default. The Restart command will be ignored if a Change command was not issued earlier.

If a line number is included in either the Chain or Restart commands, it must be a number that exists in the current program or else the program will terminate with an

error message. The line number should also be chosen to bypass any Clear statement or avoid redimensioning any variable array that had been specified earlier.

Sample Runs

In Listing 2, the first program simply sets the values of the variables. This program loads the values into the storage area. The A\$ variable is a test of strings imbedded in the source statements.) The Run Chain command is typed to load the next program on tape. A Ready message indicates that the second program has loaded. This program automatically starts running and prints out the variables from the first pro-

```

>LIST
10 INPUT"ENTER X AND Z":X,Z
20 A$="TESTING CHANGE AND RESTART"
30 PRINT A$
40 PRINT X,Y,Z
READY
>RUN
ENTER X AND Z? 3,1
TESTING CHANGE AND RESTART
3 0 1
READY
>RUN CHANGE
READY
>35 INPUT"ENTER Y":Y
>RUN RESTART 35
ENTER Y? 2
3 2 1
READY
>

```

Program Listing 3. Example of Chain and Restart Command Usage.

gram. A listing of the program shows that the new statements were loaded and that the variables printed out were indeed transferred from the first program. The second part of the figure shows a similar exercise, except that the command Run Chain "B" 30 causes the chained program to start execution at line 30, bypassing the first two print statements.

Program Listing 3 illustrates the case of a program with an error that needs to be corrected. When the program is run, the printout indicates that the value of Y had not been specified. To fix the problem, type the Run Change command to save the values that had been entered via the Input statement. After line 35 has been inserted, restart the program at line 35 by typing:

```
RUN RESTART 35
```

The final printout shows that the first three statements are skipped over and that the values of X and Z, which were input in the earlier program, have been retained.

If Basic encounters a syntax error during program execution, it will automatically put you in the Edit mode. Type Run Change and then return to the Edit mode. The variables must be protected before any changes are made.

Summary

An optional filename character can also be entered to specify the file to be retrieved from tape. The second program can be started at any specified line number (or default to the beginning if none is entered). With this added command, one can often segment a very large program into a sequence of modules which will fit in a modest sized machine.

The Chain routine is installed before any Basic programs are loaded since the code is position independent. A total of 239 bytes of memory are required for these three commands.

A Parting Note to DOS Users

The implementation presented is for a cassette-based Level II TRS-80. To modify this routine for a disk-based system, several system entry points would have to be changed. In particular, the hook to the CLOAD routine would be replaced by the corresponding routine which retrieves a program file from disk. Since the patch is entered as the Run command is processed, be familiar with the DOS extension for this command. Also, because DOS extensions are overlaid in lower RAM memory, it is more appropriate to install this patch in the DOS area, rather than waste space in upper memory. ■



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45 SIMPLEX	Linear programming solution by simplex method		
46 TRANS	Transportation method for linear programming		
47 EOQ	Economic order quantity inventory model		
48 QUEUE1	Single server queueing (waiting line) model		
49 CVP	Cost-volume-profit analysis		
50 CONDPROF	Conditional profit tables		
51 OPTLOSS	Opportunity loss tables		
52 FQOQQ	Fixed quantity economic order quantity model		

NAME	DESCRIPTION
53 FQEOUSH	As above but with shortages permitted
54 FQEOQPB	As above but with quantity price breaks
55 QUEUECB	Cost-benefit waiting line analysis
56 NCFANAL	Net cash-flow analysis for simple investment
57 PROFIND	Profitability index of a project
58 CAPI	Cap. Asset Pr. Model analysis of project

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6. A complete users manual is supplied with each module.
7. Demo Data diskettes are supplied with sample data.
8. **S.B.S.G.** has an In-House staff that can answer questions and problems related to the proper use of the **S.B.S.G. Business System** (on the telephone or through the mail).
9. First-Time Computer Owners Note-Instructions are provided for entering state payroll withholding tables. There is an additional charge if you prefer to have **S.B.S.G. Programmers** insert the correct data.
10. Minimum system requirement is 2-drives to run any single module.
11. Minimum system requirement is 3-drives to run the coordinated business system (AR-AP-GL) or (AR-AP-GL with PAYROLL).
12. Minimum system requirement is 4-drives to run the extended coordinated system (AR-AP-GL-PR and INVENTORY/INVOICING).
13. The **A. OSBORNE & ASSOCIATES** business manuals are provided **FREE** with each order (they may be purchased separately at \$20 per manual).
14. The **INVENTORY** and **INVOICING** modules are original programs written by **S.B.S.G.**
15. Each module can be purchased as independent modules to run on a 2 or more drive system except **INVOICING**.
16. Memory requirement is 48K for the **MODEL-I** and 64K for the **MODEL-II**.
17. All **S.B.S.G. BUSINESS SYSTEMS** may be upgraded up to 4-disk drives. No data is ever lost during an upgrade. There is a standard **S.B.S.G.** charge for all upgrades.

ACCOUNTS PAYABLE

The accounts payable system receives data concerning purchases from suppliers and produces checks in payment of outstanding invoices. In addition, it produces cash management reports. This system aids in tight financial control over all cash disbursements of the business. Several reports are available and supply information needed for the analysis of payments, expenses, purchases and cash requirements. All A/P data feeds General Ledger so that data is entered into the system just once. These programs were developed 5 years ago for the Wang micro-computer and have been tested in many environments since then. The package has been converted to the TRS-80™ and is now well documented, on-line, interactive micro-computer system with the capabilities of (or exceeding many larger systems).

CAPABILITIES:

- ★ menu driven; easy to use; full screen prompting and cursor control
- ★ invoice oriented; everything revolves around the invoice; handles new invoice or credit memo or debit memo
- ★ invoice information recorded; invoice #, description, buyer, check register #, invoice date, age date, amount of invoice, discount (in %), freight, tax (\$), total payable
- ★ transaction print and file maintenance procedures insure accuracy
- ★ flexible check calculation procedure; allows checks to be calculated for a set of vendors-or-for specific vendors
- ★ program prints your checks; contiguous computer checks with your company letterhead can be purchased from SBSG
- ★ reports include (samples on back):
 - open item listing/closed item listing - both detail and summary
 - debit memo listing/credit memo listing
 - aging
 - check register report (to give an audit trail of checks printed)
 - vendor listing and vendor activity (activity of the whole year)
- ★ fully linked to GENERAL LEDGER; each invoice can be distributed to as many as five (5) different GL accounts; system automatically posts to cash and A/P accounts

ACCOUNTS RECEIVABLE

The objective of a computerized A/R system is to prepare accurate and timely monthly statements to credit customers. Management can generate information required to control the amount of credit extended and the collection of money owed in order to maximize profitable credit sales while minimizing losses from bad debts. The programs composing this system were developed 5 years ago, especially for small businesses using the Wang Microcomputer. They have been tested in many environments since then. Each module can be used stand alone or can feed General Ledger for a fully integrated system.

CAPABILITIES:

- ★ menu driven; easy to use; full screen prompting and cursor control
- ★ invoice oriented; invoices can be entered before ready for billing, when ready for billing, after billing or after paid
- ★ allows entry of new invoice, credit memo, debit memo, or change/delete invoice
- ★ allows for progress payment
- ★ transaction information includes:
 - type of A/R transaction
 - customer P.O. #
 - description of P.O.
 - shipping/transportation charges
 - tax charges
 - payment
 - progress payment information
 - transaction print & file maintenance procedures insure accuracy
- ★ customer statements printed; computer statements with your company letterhead can be purchased from SBSG
- ★ reports include: (samples on back)
 - listing of invoices not yet billed
 - open items (unpaid invoices)
 - closed items (paid invoices)
 - aging
- ★ fully linked to General Ledger; will post to applicable accounts; debit A/R, credits account you specify

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PAYROLL

Payroll invoices many complex calculations and the production of reports and documents, many of which are required by government agencies. It is an ideal candidate for the computer. With this Payroll system in-house, you can promptly and accurately pay your employees and generate accurate documents/reports to management, employees, and appropriate government agencies concerning earnings, taxes, and other deductions. The package has been converted to the TRS-80™ and is now a well documented, on-line, interactive, micro-computer system with the capabilities of (or exceeding) many larger systems.

CAPABILITIES:

- ★ performs all necessary payroll tasks including:
 - file maintenance, pay data entry and verification
 - computation of pay and deduction amounts
 - printing of reports and checks
- ★ can handle salaried and hourly employees
- ★ employees can receive:
 - hourly or salary wage
 - vacation pay
 - holiday pay
 - piecework pay
 - overtime pay
- ★ employees can be paid using any combination of pay types (except, hourly cannot receive salary and salary cannot receive hourly)
- ★ special non-taxable or taxable lump sums can be paid regularly or one time (bonus, reimbursements, etc)
- ★ health and welfare deductions can be automatically calculated for each employee
- ★ earnings-to-date are accumulated and added to permanent records; taxes are computed and deducted: US income tax, Social Security tax, state income tax, other deductions (regular or one time)
- ★ paychecks are printed; computer checks with your company letter-head can be purchased from SBSG
- ★ calculations are accumulated for: employee pay history, 941A report, W-2 report, insurance report, absentee report
- ★ fully linked to General Ledger. Each employee's payroll information can be distributed to as many as (12) twelve different GL accounts; system automatically posts to cash account

INVENTORY CONTROL/INVOICING

- ★ **ISAM** (Indexed Sequential Access Method) eliminates the necessity for time consuming sort.
- ★ Pre-Allocated Files for IMMEDIATE update and inquiry capabilities.
- ★ Fast Disk storage and retrieval.
- ★ Inventory Master Record includes...class...SKU...Division...Retail...Cost...Beginning Balance...Period Sale Units...Period Receipts...On Order...On Hand...Minimum Reorder Point...Recommended Reorder Amount...Vendor Number...Period Sale Dollars...YTD Sale Units...YTD Sale Dollars.
- ★ Calculated and Displayed Formulas include...Gross Margin (\$)...Gross Margin (%)...Gross Margin ROI (%)...Average Inventory Retail (\$)...Average Inventory Cost (\$)...Turn-Over (%)
- ★ Reports Generated include...Master File Listing...Class Description Listing...Transaction Audit Trail...Minimum Reorder Point by Vendor...Retail Price List...Retail & Cost Price List...Period Sales Report...Year to Date Sales Report...Stock Status (Screen or printer output)...Commission Report (for salesmen and buyers).
- ★ Transaction Types include...Sales, Vendor Receipts...Vendor Orders...Customer Returns...Vendor Returns...Transfer Stock.

GENERAL LEDGER

The General Ledger accounting system consolidates financial data from other accounting subsystems (A/R, A/P, Payroll, direct posting) in an accurate and timely manner. Major reports include the Income Statement and Balance Sheet and a "special" report designed by management. The beauty of this General Ledger system is that it is completely user formatted. You "customize" the account numbers, descriptions, and report formats to suit particular business requirements. These programs were developed 5 years ago for the Wang micro-computer and have been tested in many environments since then. The package has been converted to the TRS-80™ and is now a well documented, on-line, interactive micro-computer system with the capabilities of (or exceeding) many larger systems.

CAPABILITIES:

- ★ more than 200 chart of accounts can be handled
- ★ account number structure is user defined and controlled
- ★ more than 1,750 transactions may be entered via:
 - direct posting; done by hand; validated against the account file before acceptance
 - external posting; generated by A/R, A/P, Payroll or any other user source
- ★ data is maintained and reported by:
 - month
 - quarter
 - year
 - previous three quarters
- ★ reports (samples on back) include:
 - trial balances
 - income statement
 - balance sheet
 - special accounts reports and more....
- ★ user formats reports with the following designated as you wish:
 - titles
 - headings
 - account numbers
 - descriptions
 - subtotals
 - totals
 - skip lines
 - skip pages
- ★ up to eight levels of totals - fully user designated
- ★ menu driven; easy to use; full screen prompting and cursor control

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ACCOUNTS RECEIVABLE	\$125	\$225	\$199.95
ACCOUNTS PAYABLE	\$125	\$225	\$199.95
GENERAL LEDGER	\$125	\$225	\$199.95
PAYROLL	\$125	\$225	\$199.95
INVENTORY	\$175	\$275	\$199.95
INVOICING	\$150	\$250	\$199.95
COORDINATED INVENTORY/INVOICING ACCOUNTS RECEIVABLE	\$449	\$749	\$599.95
COORDINATED AR-AP-GL	\$375	\$675	\$599.95
COORDINATED AR-AP-GL with PAYROLL	\$495	\$899	\$799.95
EXTENDED COORDINATED AR-AP-GL INVOICING/INVENTORY with PAYROLL	\$799	\$1299	\$1199.95

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REMSOFT, Inc.

Let Your TRS-80™ Teach You ASSEMBLY LANGUAGE

REMASSEM-1

Tired of buying book after book on assembly language programming and still not knowing your **POP** from your **PUSH**?

REMSOFT proudly announces a more efficient way, using your own TRS-80™ to learn the fundamentals of assembly language programming at YOUR pace and at YOUR convenience.

Our unique package, "INTRODUCTION TO TRS-80™ ASSEMBLY PROGRAMMING", will provide you with the following:

- ★ Ten 45-minute lessons on audio cassettes.
- ★ A driver program to make your TRS-80™ video monitor serve as a blackboard for the instructor.
- ★ A display program for each lesson to provide illustration and reinforcement for what you are hearing.
- ★ A textbook on TRS-80™ Assembly Language Programming.
- ★ Step-by-step dissection of complete and useful routines to test memory and to gain direct control over the keyboard, video monitor, and printer.
- ★ How to access and use powerful routines in your Level II ROM.

This course was developed and recorded by Joseph E. Willis and is based on the successful series of courses he has taught at Meta Technologies Corporation, the Radio Shack Computer Center, and other locations in Northern Ohio. The minimum system required is a Level II, 16K RAM.

LEARN TRS-80™ ASSEMBLY LANGUAGE DISK I/O

REMDISK-1

Your disk system and you can really step out with REMSOFT's Educational Module, **REMDISK-1**, a "short course" revealing the details of DISK I/O PROGRAMMING using assembly language.

Using the same format as our extremely popular introduction to assembly language programming, this "ASSEMBLY LANGUAGE DISK I/O PROGRAMMING" course includes:

- ★ Two 45-minute lessons on audio cassette.
- ★ A driver program to make your TRS-80™ video monitor serve as a blackboard for the instructor
- ★ A display program for each lesson to provide illustration and reinforcement for what you are hearing
- ★ A booklet of comprehensive, fully-commented program listings illustrating sequential file I/O, random-access file I/O, and track and sector I/O.
- ★ A diskette with machine-readable source codes for all programs discussed, in both Radio shack EDTASM and Macro formats
- ★ Routines to convert from one assembler format to the other

This course was developed and recorded by Joseph E. Willis, for the student with experience in assembly language programming; it is an intermediate-to advanced-level course. Minimum hardware required is a Model I Level II, 16K RAM one disk drive system.

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- VIDEO DISPLAY: character generator, video RAM, and video signal.
- KEYBOARD: every key contact tested.
- LINE PRINTER: character test.
- CASSETTE RECORDER: read/write/verify data.
- RS-232-C INTERFACE: connector fault, data transmission, framing, data loop, baud rate generator.
- DISK DRIVES: disk controller, drive select and restore, track seek and verify data, read/write/verify all tracks and sectors with or without erasing, sector formatting, disk drive timer, disk head cleaner.

- Individual tests of each device with operator monitoring and intervention.
- Continuous system tests run continually for hours testing each component, with diagnostic reports optionally written on line printer.
- One program adapts to any system configuration and hardware.
- Complete instructions and documentation.

MON-3 and MON-4

The TRS-80 Monitor Programs #3 and #4 are powerful utility programs enabling you to interact directly with the TRS-80 in Machine Language. They are as useful for beginners as for advanced programmers.

- BEGINNERS can learn to interact directly with the computer in Machine Language.
- 40-PAGE MANUAL provided with each program.
- SIMPLE commands, easy to use.

The Features Of The Monitor Programs Enable You To The Following

- DISPLAY memory in different ways.
- DISASSEMBLE memory to see Machine Language commands.
- MOVE and COMPARE memory areas.
- SEARCH through memory to find specific values.
- MODIFY memory in various ways.
- RELOCATE object programs.
- PRINT output on video display or line printer.
- READ and WRITE object tapes in SYSTEM Format.
- UNLOAD programs using low RAM on disk.
- SAVE and READ disk files (MON-4 Only).
- INPUT and OUTPUT of disk sectors (MON-4 Only).
- SEND and RECEIVE data over RS-232-C Interface (MON-4 Only).
- Create SYMBOLIC Tapes (MON-3) or Files (MON-4) of Disassembled output for Editor/Assembler program.

MON-3 (For Cassette Systems) \$39.95

MON-4 (For Disk Systems) \$49.95

SMART TERMINAL

Enables your TRS-80 to be used as a remote terminal to a time sharing computer system. Supports upper/lower case and full range of control keys, including control key mapping into any ASCII character. Automatic transmission of files between TRS-80 and host computer. Files can be read from or written to cassette tape or disk. Incoming data can be printed on line printer or stored in memory for subsequent save to cassette or disk. Disk and tape files are fully compatible with the ELECTRIC PENCIL program. Baud rate and RS-232-C sense switches can be reset without opening Expansion Interface. Requires RS-232-C interface and modem.

Cassette or Disk Version \$69.95

FASTSORT

A series of machine-language subroutines (for 16K, 32K and 48K Systems) to sort data from BASIC programs. Data may be alphabetic (string) or numeric (integer only). Works equally well with Level II or Disk Basic. Complete instructions and examples provided for interfacing with your BASIC programs.

Cassette or Disk Version \$9.95

MAILING LIST

Maintains mailing lists of over 1000 names. Commands allow adding, changing, deleting, and finding names. Sorting is done by machine language according to the information in any field (i.e., name, address, zip code). Labels printed in 1, 2, or 3 columns, in master list on one line, or on video display.

Disk Version Only \$69.95

HOME BUDGET

Combines the maintenance of your checkbook with analysis of your income, expenses, and monthly bills. Handles data including bills, including bills, income, deposits, checks and debits to your checking account, and cash expenses. Computes checkbook balance, list of unpaid bills, monthly and year-to-date summaries of income and expenses showing income tax deductions. All output printed on video display or line printer at user's option. Complete instructions for customizing to suit your own budget.

Disk Version Only \$49.95

SMALL BUSINESS ACCOUNTING

Based on Dome Bookkeeping Record #612, this program keeps track of income, expenditures, and payroll for a small business of up to 16 employees. Income and expenditures can be entered on a daily, weekly, or monthly basis, and the program computes monthly, through last month, and year-to-date summaries. Payroll section keeps record of individual employees and their paychecks with up to six categories of payroll deductions. Employee payroll record and year-to-date payroll totals can be computed. Manual contains complete instructions for customizing to suit your business.

Disk Version \$49.95

Cassette Version \$29.95

(Cassette Version does not contain payroll)

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Meet your fellow TRS-80 owner.

Users Groups

Many of you have been waiting for it, and here it is: an international list of TRS-80 users groups. This list is undoubtedly incomplete and some of the addresses are over a year old, but we believe this list to be an excellent representation of what is available to the TRS-80 owner.

80 Microcomputing intends to update this list periodically as a service to our readers. So, if anyone is forming a new group

or the group you are in did not make this list, please notify us. Also, if your group has changed its name or is no longer in existence let us know.

Users groups are an excellent way to get to know other people in the microcomputer hobby/business as well as a good resource for help in solving your computer problems. We hope our readers find this list useful. ■

STATE	GROUP NAME	ADDRESS	CITY	ZIP	CONTACT
=====	=====	=====	=====	=====	=====
	REGINA OPERATORS OF MICRO SYSTEMS	BOX 1001	REGINA	S4P3B2	WENDY MOFFATT
	BRASILIAN CLUB	RUA SAMBAIBA 516. LEBLON	RIO DE JANEIRO, 2245	BRASIL	DOUGLAS GILSON
AK	ANCHORAGE USERS GROUP	BOX 10, 385 SOUTH STATION	ANCHORAGE	99511	
AL	CENTRAL ALABAMA COMPUTER SOCIETY	2073 REXFORD RD	MONTGOMERY	36116	L GARRISON
AL	G2C3	4307 OLD SHELL RD	MOBILE	36600	G. REAGAN
AL	CENTRAL AL MICRO SOCIETY JUNIOR CHAPTER	RT. #3 BOX 570	MONTGOMERY	36110	FREDERICK FERGUSON
AZ	USERS GROUP OF ARIZONA	6218 W. MARLETTE	GLENDALE	85301	ROD PURCELL, PRES.
AZ	PHOENIX USERS GROUP	1850 EAST MARYLAND #27	PHOENIX		
AZ	ARIZONA USERS GROUP	4322 EAST FAIRMONT	PHOENIX	85018	R WARREN
CA	USERS AND ABUSERS	1350 GRANT RD.	SUNNYVALE	94040	RADIO SHACK
CA	CAUSE (SOFTWARE EXCHANGE)	18651 VON KARMAN	IRVINE	92713	SEL HANDLER
CA	USERS GROUP	712-C COUNTRY WOOD	WALNUT CREEK	94598	
CA	PACIFICA USERS GROUP	338 ALIDA WAY #306	SOUTH SAN FRANCISCO	94008	J. STRAZZARINO
CA	REDWOOD EMPIRE USERS GROUP	7136 BELITA AVE.	ROHNERT PARK	94928	JOHN REVELLE
CA	SOUTH BAY USERS GROUP	3605 PINE AVE	MANHATTEN BEACH	90266	S. NIMS
CA	EAST BAY USERS GROUP	17 ECHO AVE	OAKLAND	94611	
CA	SAN FRANCISCO TRS-80 USERS GROUP	338 ALIDA WAY #306	SOUTH SAN FRANCISCO	94008	JOHN F. STRAZZARINO
CA	HOMEBREW COMPUTER CLUB	BOX 626	MOUNTAIN VIEW	94042	
CA	INLAND COMPUTER SOCIETY	3359 SECOND ST	RIVERSIDE	92501	
CA	SOUTH BAY USERS GROUP	BOX 6302	STANFORD	94305	B. DEVENDORF
CA	TRS-80 FREE PROGRAM EXCHANGE	4418 MORROW RD.	MODESTO	95350	
CA	COUNTRYWIDE USER GROUP	10409 STATE ST.	SOUTH GATE	90200	J. MCGORTEY/S. NIMS
CA	LITTON CALCULATOR/COMPUTER CLUB	5500 CANOGA AVE	WOODLAND HILLS	91364	W. BENNETT
CA	MARIN COUNTY USERS GROUP (MCTUG)	45 SELFRIDGE WAY	HAMILTON AFB	94934	PAT MCMAHON
CA	SONOMA COUNTY COMPUTER CLUB	BOX 945	COTATI	94928	
CA	IEEE COMPUTER SOCIETY	5855 NAPLES PLAZA, SUITE 301	LONG BEACH	90803	
CA	MONTEREY BAY USERS GROUP	1002 HALSEY DR	MONTEREY	93940	CURT BESS
CA	TRS-80 NIBBLERS	2555 HESPERIAN BLVD	HAYWARD	94545	
CA	VALLEY COMPUTER CLUB	3311 WEST THIRD, APT. 1-319	LOS ANGELES	90020	KENNETH YOUNG
CA	PAMONA COMPUTER SOCIETY	4155 OAK HOLLOW RD.	CLAREMONT	91711	
CA	THE FORTH INTEREST GROUP	PO BOX 1105	SAN CARLOS	94070	
CA	ORANGE COUNTY USERS GROUP	3521 E. COMMONWEALTH	FULLERTON	92631	ED FAULK, PRES.
CA	SAN FRANCISCO USERS GROUP	HQ USARRIX	PRESIDIO OF SAN FRAN	94129	P. MCMAHON
CA	VENTURA COUNTY TRS-80	2534 NORTH TEMPLE AVE.	CAMARILLO	93010	CLUB NEWSLETTER
CA	USERS GROUP	7465 HOLLISTON AVE., SUITE 213	GOLETA	93017	
CA	VENTURA COUNTY TRS-80 COMPUTER CLUB	567 WEST LOOP DR.	CAMARILLO	93030	L. STEINMETZ
CA	VALLEY TRS-80 USERS GROUP (VTUG)	19116 NASVILLE ST	NORTHBRIDGE	91326	WILLIAM WHITE
CA	SACRAMENTO USERS GROUP	1237 BEARD WAY	CARMICHAEL	95600	MIKE MOORE
CA	SAN JOSE USERS GROUP	3490 BON AIR COURT	SAN JOSE	95117	C S SHANKS
CA	ET-3400 USERS GROUP	11231 OAK ST.	EL MONTE	91731	CHARLES VAN DYKE
CA	TRS-80 USERS GROUP OF NAPA	4432 SPRINGWOOD	NAPA	94550	
CA	ORASIS USERS GROUP	PHASE ONE SYSTEMS	OAKLAND		FRED BELLAMY
CA	SAN GABRIEL VALLEY TRS-80 USERS GROUP	750 E. 5TH ST. #75	AZUSA	91702	DAN DRESSELHAUS
CAN	AURORA COMPUTER SOCIETY	BOX 4342	EDMONTON, ALBERTA	T5H1R5	BOB HUNTINGFORD
CAN	USERS GROUP OTTAWA	2 LARSEN CT.	KANATO, ONTARIO	K2L1Y8	
CN	KITCHENER-WATERLOO MICRO CLUB	UNIVERSITY OF WATERLOO	WATERLOO, ONT	N2L3G1	
CT	CONNECTICUT COMPUTER CLUB	18 RIDGE COURT WEST	WEST HAVEN	06516	TAYLOR
CT	SOUTHERN NEW ENGLAND COMPUTER SOCIETY	267 WILLOW ST	NEW HAVEN	06511	
CT	NORTH EASTERN BASIC FOUR USER GROUP	22 TOBBY RD.	BLOOMFIELD	06002	JOHN PEARSE
CT	FAIRFIELD COUNTY TRS-80 USERS GROUP	10 RICHLER RD.	NORWALK	06851	ALAN ABRAHAMSON
CT	CONN MICROISTS	8802 WENDY LANE	WESTPORT	06881	
DC	TCUG	2617 42ND ST NW #2	WASHINGTON	20007	R. DALY
DE	DELAWARE USERS GROUP	1116 PIPER RD.	WILMINGTON	19803	TIM J. IHDE
DE	DELAWARE USERS OF MICROS	318B CHAPEL AVE	CLAYMONT	19703	JODIE S. HOBSON
ENG	NORTH LONDON HOBBY COMPUTER CLUB	HOLLOWAY RD.	N. LONDON	N7 8DB	R. BRADBERN LONDON P
FL	TBUG-80	PO BOX 247	TAMPA	33602	RAY ECHENBACH
FL	CLUB OF CENTRAL FLORIDA	152 MILL RUN DRIVE	LAKE MARY	32746	SILOM HORWITZ
FL	ORLANDO, FL, COMPUTER CLUB	ADVENTURE INTERNATIONAL	ORLANDO	32802	SCOTT ADAMS
GA	USERS GROUP OF ATLANTA, LTD.	1315 RUSTIC RIDGE DR, N.E.	ATLANTA	30319	BOB GREEN 4/81
GA	CSRA COMPUTER CLUB	BOX 284	AUGUSTA	30903	
GA	USERS GROUP OF ATLANTA, LTD.	3408 CLAIRMONT RD, N.E.	ATLANTA	30319	
GRC	USERS GROUP	CHRYCOSTOMOU SHYRNIS 30	NEO PSYHIKO		G. ANTIMISIARIS
IA	DES MOINES USERS GROUP (DM-TUG)	#303 4215 GRAND AVE	DES MOINES	50312	DENNIS R. SOLOMON
IA	MARSHALLTOWN COMPUTER CLUB	1101 SOUTH 2ND AVE	MARSHALLTOWN	50150	D. GROVES

STATE	GROUP NAME	ADDRESS	CITY	ZIP	CONTACT
*****	*****	*****	*****	*****	*****
IA	DES MOINES USERS GROUP (DM-TUG)	4215 GRAND AVE, #303	DES MOINES	50312	BOB HEATHCOTE
IA	TRS-80 USER GROUP	1400 EAST POST B	MARION		STEVEN CREE
IL	COMPUTER RENTAL SERVICE	RR BOX 1138	CRETE	60417	R BEPTIES
IL	PEORIA AREA COMPUTER CLUB	2019 NORTH IDAHO	PEORIA	61604	
IL	CHICAGO TRS-80 USERS GROUP	3950 N.LAKE SHORE DRIVE	CHICAGO	60613	MANNY GARCIA
IL	QUAD CITY COMPUTER CLUB	4211 1/2 7TH AVE.	ROCK ISLAND	61201	
IL	CHICAGO AREA COMPUTER HOBBYIST EXCH	BOX 52	SOUTH HOLLAND	60473	LEAH R O'CONNOR
IN	USERS GROUP	2203 CORD ST.	INDIANAPOLIS	46224	J. HILL
IN	GROUP OFF SOUTHWEST INDIANA	BOX 3284	EVANSVILLE	47732	M ANDERSON
IN	INDIANAPOLIS TRS-80 USERS GROUP	2203 CORD ST.	SPEEDWAY	46224	JAMES R. HILL
KS	COMPUTER NETWORK OF KANSAS CITY	7631 BROADMOOR LANE	OVERLAND	66204	
KS	GREATER KANSAS CITY USEAS GROUP	8909 WENONGA	LEAWOOD	62206	
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Show your students beauty in number systems.

Alternate Course—Part IV

Michael A. Duffin
1507 East Avenue
Berwyn, IL 60402

One of the most difficult concepts to understand in data processing is that of different numbering systems. It is particularly difficult to grasp in an introductory course. Most courses introduce these concepts within the first few weeks of class. Thus, most students are inundated with binary, octal and hexadecimal manipulations within a time period of two to ten days. Then they never see the numbering systems again except on tests.

When I teach numbering systems in "An Introduction to Data Processing" at Morton College in Cicero, IL, I try to spread these ideas over a 12-week period. Since I believe that most people fear mathematics, I make my initial presentations in a non-mathematical fashion.

The first time I introduce binary numbers I use the chart shown in Table 1.

I ask my students if there is anyone who doesn't recognize these characters. (I have a real problem with those that don't.) I then ask them what numbers would be left if we could only use the numbers zero and one. From all of the numbers printed, the only ones that use just the digits 0 and 1 are 0, 1, 10, 11, 100,

101, 110 and 111. I write these numbers above the first line in the chart so that we have the following:

0	1	10	11	100	101	110	111												
0	1	2	3	4	5	6	7	8	9										

The next thing to do is to look for a pattern in these numbers. (What is the next number if we follow the same pattern?) I receive some interesting answers the first time this question is asked. These answers range anywhere from 112 to 222. Finally, in a moment of inspiration (or frustration) someone will say 1000. From that point on it is easier to determine the numbers that follow. Once everyone understands the pattern, I usually have them construct a table with the first 40 decimal and binary numbers printed side by side.

Someone always asks, "Why do we use binary numbers?" I usually split this question into two parts. The first part of this question is "Why?" I explain that philosophers have been trying to figure out the answer to this question since the beginning of time. The second part of this question is "Do we use the binary numbering system?" The answer to this is "Yes." I realize that this doesn't tell the student a heck of a lot but it does keep their attention.

The reason we use the binary numbering system in data processing is that the computer

uses these numbers. I tell them that a computer is similar to a machine made up of switches, each like a light switch. The only thing you can do with a light switch is turn it on or off. Thus, every time a computer sees a one it turns a switch on. Every time it sees a zero it turns the switch off.

I spread the above information over two or three 15-minute periods. Let's face it, numbering systems are boring. To expect a student to pay attention for an hour or so is a bit much to ask.

Once my students have constructed a decimal-binary chart, simple addition and subtraction problems become easy. For example, if we wish to add 1010 and 11000 we can look up the decimal equivalents of these numbers. We find that 1010 corresponds to decimal 10 and 11000 corresponds to decimal 24. If we look next to decimal 34, our answer is 100010.

When we have had our fill of binary (that doesn't take long) we then look at octal and hexadecimal. To introduce octal numbers we use the same chart that was used to introduce binary numbers. Only this time we choose only those numbers that have the digits 0, 1, 2, 3, 4, 5, 6 or 7 in them (see Table 2).

Then we add these numbers to our decimal-binary chart and we can again perform simple addition and subtraction problems using the above techniques.

Introducing hexadecimal numbers is more confusing to the students because they aren't used to seeing the characters A, B, C, D, E and F used as numbers. However, by adding these numbers to the chart, we can again perform simple addition and subtraction problems. Our chart now looks like Table 3.

The chart is useful for adding or subtracting small numbers in the numbering systems described. However, it does have its limitations. To be specific, it's no good for numbers above decimal 40 without some additional knowledge.

To add or subtract in any numbering system, you must first understand how to add in the decimal numbering system. Let's look at an example using decimal numbers:

$$\begin{array}{r} 869 \\ + 732 \\ \hline \end{array}$$

To add these numbers we add each row individually: $9 + 2 = 11$, so you bring down a 1 and carry a 1. $6 + 3 = 9$ plus the 1 that was carried is 10, so we bring down the 0 and carry the 1. $8 + 7 = 15$ plus the 1 we carried is 16. Thus, our final answer is 1601.

The same basic rules are true in almost any numbering system. The only thing that changes is when you have to carry a number, and what follows a number in that numbering system.

To illustrate this, let's look at another example; but this time

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let's look at one in the hexadecimal numbering system.

$$\begin{array}{r} 6A4 \\ +3CA \\ \hline \end{array}$$

Once again we perform our operations column by column. The first thing we have to do is add A and 4. The way my students were told to do this is to look at their charts. We find that a hexadecimal A is the same as a decimal 10 and a hexadecimal 4 is the same as a decimal 4. Since 10 + 4 in decimal is 14, we now look at our chart and see what a decimal 14 is in hexadecimal. We discover that the answer is E. We have no number to carry this time since E is a single-digit answer.

Next, we must add A + C. We find that hex A equals decimal 10 and hex C equals decimal 12. Adding 10 and 12 gives us 22 which is equivalent to hexadecimal 16. Thus, we bring down the 6 and carry the 1.

Finally, we add 6 and 3 plus the 1 we carried. This is the point where many students get screwed up. They forget the numbering system that they're working in. Many students incorrectly give the answer as 10. What they have forgotten is that they are working in hexadecimal and 6 + 3 + 1 is not 10 in hexadecimal. The number which follows 9 in hexadecimal is A.

Thus, the answer to our prob-

lem is A6E.

Now I'm sure that these techniques are causing many mathematicians to turn over in their graves because I haven't explained the numbering systems using the powers of the various bases or the Remainder Theorem. However, I am a strong believer in logical deduction and I would much rather have my students discover these formulas for themselves.

One thing that I haven't discussed up to this point is the answer to the question: "Why do

we have to learn this junk?" and "What does the computer do with all this stuff?" As I mentioned earlier, most computers are binary machines, and that's why we must learn something about binary.

To explain why we must learn about hex and octal I usually bring in a dump. A dump is the result of a sick program or computer system. When a large system can't figure out what the heck your program is trying to do, it spits it out as a dump. An IBM system prints out its dumps

in hexadecimal. A Honeywell system prints out its dumps in octal. The reason they don't print out their dumps in binary (which is what both computers are using) is that hex and octal use much less paper. When the computer gives up trying to execute a sick program, the first thing it does is convert all those little binary numbers into hex or octal.

To illustrate how the computer converts binary to octal and binary to hexadecimal, I use an example. Pick a binary number such as 100001 and split it up into groups of four starting from the right so that we have groups of binary numbers. In this example we get the numbers 10 and 0001. Now we take these individual numbers and look for them in the binary section of our chart. Then we look up the hexadecimal equivalents of these numbers. Thus, binary 10 is equivalent to hex 2 and binary 0001 is equivalent to hex 1. (Leading zeros are always dropped). Sure enough, if we look up hexadecimal 21 on our chart we find that it equals binary 100001.

A similar method converts a binary number to an octal number. Look at example 100001 again. This time split the original binary number into groups of three. So, the numbers we get are 100 and 001. If we look these numbers up in our table we find that a binary 100 is equal

0	1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	29
30	31	32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47	48	49
50	51	52	53	54	55	56	57	58	59
60	61	62	63	64	65	66	67	68	69
70	71	72	73	74	75	76	77	78	79
80	81	82	83	84	85	86	87	88	89
90	91	92	93	94	95	96	97	98	99
100	101	102	103	104	105	106	107	108	109
110	111	112	113	114	115	116	117	118	119

Table 1. Decimal Numbers

0	1	2	3	4	5	6	7
10	11	12	13	14	15	16	17
20	21	22	23	24	25	26	27
30	31	32	33	34	35	36	37
40	41	42	43	44	45	46	47
50	51	52	53	54	55	56	57
60	61	62	63	64	65	66	67
70	71	72	73	74	75	76	77
100	101	102	103	104	105	106	107

Table 2. Octal Numbers

Program Listing 1

```

10 REM *****
**
20 REM *
24 REM *           MORTGAGE PROGRAM PLUS
28 REM * BY      MIKE DUFFIN
32 REM *           USED AS AN EXAMPLE PROGRAM
36 REM *           IN DPR 101
40 REM *           AT MORTON COLLEGE IN BERWYN, ILL.
44 REM *
48 REM *****
****
52 REM *
56 REM *           LIST OF VARIABLES
60 REM *
64 REM * X ----- AN ARRAY INDEX WITH 4 SPECIFIC VALUES
68 REM *           1   REQUIRED PAYMENT
72 REM *           2   REQUIRED PAYMENT WITH INFLATION CON
SIDERED
76 REM *           3   REQUIRED PAYMENT + EXTRA PAYMENT
80 REM *           4   REQUIRED PAYMENT + EXTRA PAYMENT
84 REM *           WITH INFLATION CONSIDERED
88 REM *
92 REM *           VARIABLES THAT USE THE X INDEX
96 REM *           PL----- PRINCIPAL REMAINING
100 REM *           AP----- ACTUAL PAYMENT FOR A PERIOD
104 REM *           TP----- TOTAL PAYMENTS FOR ALL PERIODS
108 REM *           AI----- INTEREST FOR A GIVEN PERIOD
112 REM *           TI----- TOTAL INTEREST FOR ALL PERIODS
116 REM *           LP----- LAST PAYMENT FOR A SPECIFIC INDEX
120 REM *           B ----- ACTUAL NUMBER OF PAYMENTS

```

```

124 REM *           TP----- ACTUAL PRINCIPAL PAID FOR A PERIOD
128 REM *
132 REM *
136 REM * A..... ORIGINAL AMOUNT BORROWED
140 REM * AY..... PERIOD OF TIME THAT LOAN EXTENDS WHEN
144 REM *           AN ADDITIONAL PAYMENT IS MADE
148 REM * AS..... VARIABLE WITHIN INKEYS INSTRUCTION
152 REM *           THAT ALLOWS THE USER TO TAKE TIME
156 REM *           TO READ AT HIS/HER OWN PACE.
160 REM * CO..... COUNTER IN FOR-NEXT LOOP.
164 REM * DO..... VALUE OF ONE DOLLAR AFTER INFLATION.
168 REM * E..... REQUIRED MONTHLY PAYMENT.
172 REM * EX..... MONTHLY PAYMENT PLUS EXTRA.
176 REM * IR..... USERS ESTIMATE OF ANNUAL INFLATION RAT
E.
180 REM * IY..... INTEGER PART OF ACTUAL NUMBER OF YEARS
184 REM *           IT TAKES TO PAY OFF LOAN WHEN AN
188 REM *           ADDITIONAL PAYMENT IS MADE.
189 REM * K..... MONTHLY INFLATION RATE.
190 REM * N..... NUMBER OF MONTHS (REFER TO IY,AY)
191 REM * NI..... MONTHLY INFLATION RATE (REFER TO IR)
192 REM * MP..... USERS EXTRA MONTHLY PAYMENT.
193 REM * P..... INTERVAL BETWEEN PAYMENTS.
194 REM * Q..... FOR-NEXT COUNTER (BASED ON EP)
195 REM * SW..... SIGNIFIES LAST PAYMENT HAS BEEN MADE.
196 REM * T..... INTEREST CHARGED BY LOAN COMPANY.
197 REM * T0..... SIGNIFIES ONLY THE TOTALS ARE TO BE
198 REM *           PRINTED.
200 REM * Y..... ORIGINAL NUMBER OF YEARS FOR LOAN.

```

Program continues

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Program continued

```
202 REM * Z..... ORIGINAL TOTAL NUMBER OF PAYMENTS.
204 REM *
206 REM *****
**
220 CLS
240 PRINT "THIS PROGRAM WILL : "
242 PRINT " 1. DETERMINE PAYMENTS FOR A LONG TERM
      LOAN"
244 PRINT " 2. DETERMINE HOW MUCH YOU WILL SAVE IF"
245 PRINT "     YOU PAY EXTRA"
246 PRINT " 3. CONSIDER THE IMPACT OF INFLATION ON"
247 PRINT "     BOTH TYPES OF PAYMENTS."
248 GOSUB 4000
249 CLS
250 PRINT
260 INPUT "WHAT IS THE AMOUNT BORROWED ($)";A
262 IF A=0 THEN GOTO 260
280 INPUT "      INTEREST CHARGED.";I
282 IF I=0 THEN GOTO 280
300 INPUT "      INTERVAL BETWEEN PAYMENTS (MONTH
      S)";P
302 IF P=0 THEN GOTO 300
320 INPUT "      TERM OF LOAN (YEARS)";Y
322 IF Y=0 THEN GOTO 320
330 INPUT "      EXTRA PAID PER MONTH (OPTION
      AL)";MP
334 INPUT "      ESTIMATED YEARLY INFLATION RATE
      E ";IR
336 EP=MP
340 PRINT
350 INPUT "DO YOU WISH TO SEE THE TOTALS ONLY - INSTEAD
      OF THE ENTIRE TABLE - (1=YES, 0=NO)";T0
380 PRINT
390 IF T0 > 0 THEN GOTO 450
400 PRINT "      OUTSTANDING"
410 PRINT "      PRINCIPAL AT
      PRINCIPAL"
420 PRINT "      END          INTEREST
      REPAID AT"
430 PRINT "PERIOD          OF PERIOD          AT END OF PER.
      END OF PER"
440 PRINT
445 'INITIAL VALUES'
450 Z=(Y*12)/P
460 K=(I*(P/12))/100
470 E=A*K/(1-1/(1+K)Z)
472 E=INT(E*100+.5)/100
480 DO=1
490 MI=IR/12/100
492 DEFDBL P,L
500 PL(1)=A: PL(2)=A: PL(3)=A: PL(4)=A
510 AP(1)=E:AP(2)=E:AP(3)=E+MP:AP(4)=E+MP
520 TP(1)=0:TP(2)=0:TP(3)=0:TP(4)=0
530 TI(1)=0: TI(2)=0: TI(3)=0: TI(4)=0
540 FOR CO = 1 TO Z
550     IF MP=0 THEN Q=2 ELSE Q=4
560     IF PL(3)<= 0 THEN Q=2
570     FOR X=1 TO Q
580         GOSUB 1000
590     NEXT X
```

```
600     IF MP=0 THEN X=1 ELSE X=3
601     IF SW=1 THEN GOTO 630
602     IF LP(X)=0 THEN SW=1
604     IF T0>0 THEN GOTO 630
610     GOSUB 2000
620     GOSUB 3000
630     DO=DO - DO*MI
640     NEXT CO
644 REM *****
648 REM *
652 REM *     THE FOLLOWING STATEMENTS WRITE THE
656 REM *     SUMMARY REPORTS.
660 REM
664 REM *****
**
684 GOSUB 4000
686 GOSUB 5000
688 CLS
696 PRINT "IF YOU MADE ONLY THE REQUIRED MONTHLY PAYMEN
      T OF "
700 PRINT "$"E
704 PRINT "THEN YOUR TOTAL INTEREST PAYMENT WAS "
708 PRINT "$"TI(1)" AND THE TOTAL PRINCIPAL REPAID W
      AS "
712 PRINT "$"A" THUS THE TOTAL AMOUNT PAID WAS "$TP(1)
716 PRINT
720 GOSUB 4000
722 IF IR=0 THEN GOTO 740
724 PRINT "DUE TO THE "IR"% YEARLY INFLATION RATE THE T
      OTAL "
728 PRINT "AMOUNT ("TP(1)") IS ACTUALLY WORTH "$TP(2)
732 PRINT "OF TODAY'S DOLLARS."
736 GOSUB 4000
740 IF MP=0 THEN GOTO 816
744 PRINT "BY PAYING "$E+MP"INSTEAD OF "$E" PER MONTH"
748 PRINT "YOU PAID "$TP(3)" INSTEAD OF "$TP(1)
752 AY=B(3)/12
756 IY=INT( B(3)/12)
760 IF AY=IY THEN GOTO 772
764 M=INT((AY-IY)*12)
768 AY=IY
772 PRINT
776 GOSUB 4000
780 PRINT "THE LOAN WILL BE REPAID"
784 PRINT "IN "AY" YEARS AND "M"MONTHS"
788 PRINT "INSTEAD OF "Y" YEARS"
792 PRINT "BY PAYING "$E+MP" PER MONTH"
796 PRINT "INSTEAD OF "E" PER MONTH."
800 GOSUB 4000
802 IF IR=0 THEN GOTO 832
804 PRINT "HOWEVER WITH THE "IR"% YEARLY"
808 PRINT "INFLATION RATE "$TP(3)" IS WORTH"
812 PRINT "$"TP(4)" IN TODAY'S DOLLARS."
816 PRINT
818 IF IR=0 AND MP=0 THEN GOTO 832
820 PRINT "OK? WELL, LET'S SUM THIS UP."
824 PRINT
828 GOSUB 4000
832 CLS
840 PRINT " ";TAB(20);"REQUIRED-WITH EXTRA"
842 IF MP=0 THEN EX=0 ELSE EX=E+MP
```

Program continues

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Program continued

```

844 PRINT "MONTHLY PAYMENT" $"E;TAB(29);"/$"EX
846 IF MP=0 THEN TP(3)=0
848 PRINT "TOTAL PAYMENT" $"TP(1);TAB(29);"/$"TP(3)
)
850 IF IR=0 THEN GOTO 860
852 PRINT "VALUE OF TOTALS" $"TP(2);TAB(29);"/$"TP(4)
)
856 PRINT "(IN TODAY'S DOLLARS)"
860 PRINT "LOAN REPAID IN ";TAB(21);Y;TAB(24);"YEARS/"
AY;TAB(34);"YRS";TAB(39);"MO"
864 PRINT
866 IF MP=0 THEN GOTO 990
868 PRINT "AMOUNT SAVED OR LOST" $"INT((TP(1)-TP(3))
*100+.5)/100
870 IF IR=0 THEN GOTO 880
872 PRINT "ACTUAL AMOUNT SAVED"
876 PRINT "OR LOST("IR"% INFLATION)" $"INT((TP(2)-TP(4))
*100+.5)/100
880 PRINT "NOTE: NEGATIVE VALUES MEAN YOU WILL BE"
884 PRINT " PAYING ADDITIONAL MONEY."
990 END
992 REM *****
****
993 REM * THE FOLLOWING ROUTINE DETERMINES THE
994 REM * ACTUAL INTEREST (AI),TOTAL INTEREST (TI
)
995 REM * ACTUAL PAYMENT (AP), TOTAL PAYMENT (TP)
996 REM * AND DETERMINES IF WE HAVE THE LAST
997 REM * PAYMENT (LP) FOR ALL VALUES OF X.
998 REM *****
1000 AI(X)=K*PL(X)
1001 AP(X) = E
1002 IF X>2 THEN AP(X)=G+MP
1006 LP(X)=PL(X)
1008 IF LP(X)=0 THEN GOTO 1070
1009 IF PL(X)<AP(X) THEN AP(X)=AI(X) :GOSUB 6000:GO"
020
1010 PL(X)= PL(X) - (AP(X) - AI(X))
1012 IF PL(X)<=0 OR CO=Z THEN GOSUB 6000
1020 IF X/2 <> INT(X/2) THEN GOTO 1050
1030 AI(X) = AI(X) * DO
1040 AP(X) = AP(X) * DO
1050 TP(X) = TP(X) + AP(X)
1060 TI(X) = TI(X) + AI(X)
1070 REM
1080 RETURN
1090 REM *****
1092 REM *
1094 REM * THE FOLLOWING ROUTINE ROUNDS THE
1096 REM * PRINCIPAL LEFT (PL),ACTUAL INTEREST TH
S
1098 REM * PERIOD (AI),AND THE PRINCIPAL PAID
2000 REM * THIS PERIOD (TP) TO 2 DECIMAL PLACES.
2002 REM *
2004 REM *****
****
2010 AI(X) = INT( AI(X) * 100 + .5)/100
2020 TP = INT( ( AP(X) - AI(X) ) * 100 + .5 )/100
2030 RETURN

```

```

2800 REM *****
*
2810 REM *
2820 REM * THE FOLLOWING ROUTINE PRINTS THE VALUES
2830 REM * FOR THE CURRENT PERIOD (CO), THE
2840 REM * PRINCIPAL LEFT (PL) AND
2850 REM * THE INTEREST THIS PERIOD (AI) AND
2860 REM * THE PRINCIPAL PAID THIS PERIOD (TP)
2870 REM *
2880 REM *****
**
3000 REMARK
3010 PRINT CO;TAB(11);INT( PL(X)*100 + .5)/100;TAB(29);
AI(X);TAB(48);TP
3090 RETURN
3900 REM *****
3910 REM *
3920 REM * THE FOLLOWING ROUTINE ALLOWS THE USER
3930 REM * TO KEEP A SCREEN UNTIL HE OR SHE
3949 REM * IS READY TO CHANGE IT.
3950 REM *
3969 REM *****
*
4000 REM
4010 PRINT "PRESS ANY KEY TO CONTINUE."
4020 A$= INKEY$: IF A$="" THEN GOTO 4020
4022 PRINT
4030 RETURN
4900 REM *****
4910 REM *
4920 REM * THE FOLLOWING ROUTINE ROUNDS
4930 REM * AI,TI,TP AND E FOR ALL VALUES OF X.
4940 REM *
4950 REM *****
5000 REM
5010 FOR X= 1 TO 4
5020 AI(X)=INT( AI(X)*100 +.5)/100
5030 TI(X)=INT( TI(X)*100 + .5)/100
5040 TP(X)=INT( TP(X)*100 + .5)/100
5042 E=INT(E*100 +.5)/100
5050 NEXT X
5060 RETURN
5900 REM *****
**
5910 REM *
5920 REM * THE FOLLOWING ROUTINE DETERMINES
5930 REM * THE FINAL VALUES OF AP,LP
5940 REM * AND LP. IT ALSO SETS THE
5950 REM * ENDING PERIOD (B) TO THE CURRENT
5969 REM * VALUE OF THE PERIOD (CO) FOR
5970 REM * FOR ALL VALUES OF X.
5980 REM *
5990 REM *****
****
6000 REM
6002 IF PL(X)>0 THEN GOTO 6050
6010 AP(X)=PL(X)-AI(X)
6040 GOTO 6060
6050 AP(X)=AP(X)+PL(X)
6060 PL(X)=0
6062 B(X)=CO
6070 LP(X)=0
6100 RETURN

```

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to an octal 4 and a binary 1 is equivalent to an octal 1. If we look up an octal 41 in our table we find miraculously that it is equivalent to a binary 100001.

This method will always work so that if we have a binary number such as 110001101 which is too large for our table we can still convert it to octal or hex. The numbers 1, 1000, 1101 are equivalent to 1, 8, D in hex, so binary 110001101 equals 18D in hex. The numbers 110, 001, 101 are equivalent to 5, 1, 3 in octal, so binary 110001101 is equal to 513 in octal.

For those of you who would like to know why this works, we have to explain a little bit about the three numbering systems. First of all binary is a two-digit numbering system (0,1) which means that every binary number is actually some power of 2. Octal is an eight-digit numbering system (0-7) so every octal number is a multiple of a power of eight, and hexadecimal is a 16-digit numbering system (0-F) which means that every hexadecimal number is related to a power of 16. Now, if we think about these statements, we remember that 8 is a power of 2 and so is 16. (2 raised to the third power is 8 and 2 raised to fourth power is 16.) Although this doesn't entirely explain why the above technique works, I think some of the mathematicians out there are turning back around.

The program that I have included at the end of this article is one I call Mortgage Program Plus. The main body of it is virtually the same as many other mortgage programs. It involves no graphics nor does it use any unusual Basic capabilities. I use it with those students who feel that learning about computers has to involve a lot of pain, agony and number crunching. It uses a whole slew of variables. The uses of these variables are all explained within the program.

The difference between this program and most mortgage programs is that it takes the inflation rate into account. I strongly urge those of you who have loans and are considering paying them off early or those of you who are paying a little bit more than the required payment towards your mortgage to run this program first. By paying a little bit more than the required payment you will pay off your loan quicker. However, you may be losing money because of the inflation rate.

As you might have already guessed, this program has nothing to do with numbering systems. However, numbering systems are an intricate part of all programming activities. For those involved with assembler programming and those of you who will be required to interpret dumps, I hope that this article will be useful.

For those who are mathematicians I think that you will have a good time dissecting the mortgage program. For those who are teaching data processing, I

hope I have provided some techniques that you will find useful in your classes. If you are data processing students...good luck! ■

Decimal	Binary	Hexadecimal	Octal
0	0	0	0
1	1	1	1
2	10	2	2
3	11	3	3
4	100	4	4
5	101	5	5
6	110	6	6
7	111	7	7
8	1000	8	10
9	1001	9	11
10	1010	A	12
11	1011	B	13
12	1100	C	14
13	1101	D	15
14	1110	E	16
15	1111	F	17
16	10000	10	20
17	10001	11	21
18	10010	12	22
19	10011	13	23
20	10100	14	24
21	10101	15	25
22	10110	16	26
23	10111	17	27
24	11000	18	30
25	11001	19	31
26	11010	1A	32
27	11011	1B	33
28	11100	1C	34
29	11101	1D	35
30	11110	1E	36
31	11111	1F	37
32	100000	20	40
33	100001	21	41
34	100010	22	42
35	100011	23	43
36	100100	24	44
37	100101	25	45
38	100110	26	46
39	100111	27	47
40	101000	28	50

Table 3. Chart of Decimal, Binary, Hexadecimal and Octal Numbers

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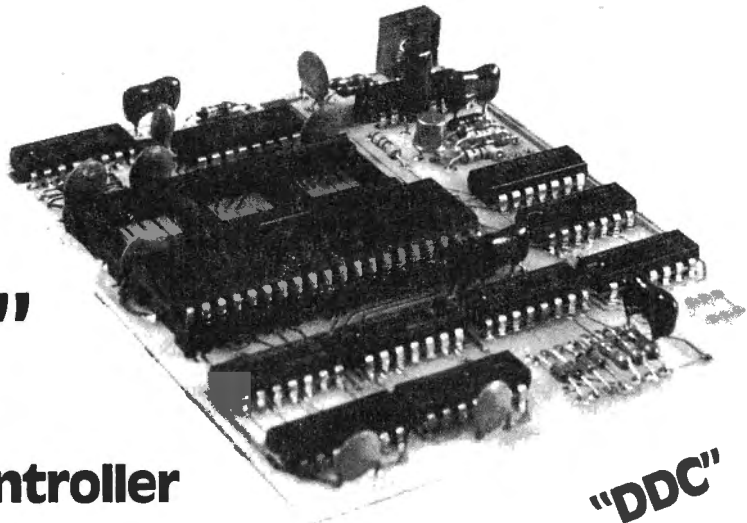
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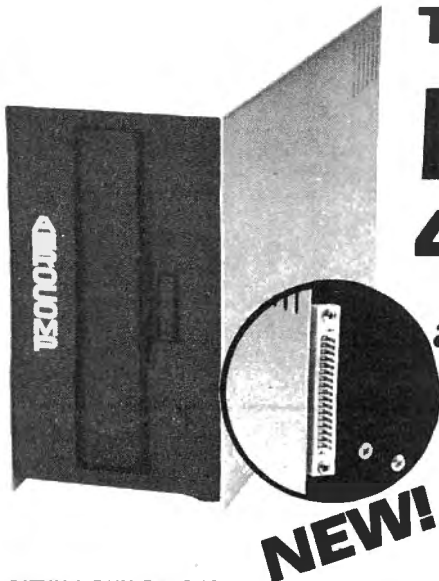
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Merge For Level II

*William J. Dalesandry Jr.
355 Rockfield Rd.
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Until now, Merge was only available to DOS users, but now you can have it on Level II. Merge offers an extremely useful additional command statement to an already powerful repertoire of commands available. The program is also compatible with Microsoft's Level III cassette Basic.

Normally when you CLOAD a program, it writes over any program already in memory and the resident program is lost. This new command, used either from the keyboard in command mode or as a program statement,

loads two or more Basic programs into memory at the same time. The second program and all subsequent programs will merge with the root program or programs to form one contiguous program.

Because the program loads into memory at location 28000 (6D60H) then relocates itself to the bottom of Basic's user RAM area, it is compatible with Level III, Level II and other Basic extension programs. This relieves the inconvenience of reserving space in high memory. It requires no modification because of the size of your system. Basic starts at the same place in a 4K system as it does in a 48K system and because it requires no memory to be reserved, you can load it at any time without answering the question memory size?

Merge is such a useful command I cannot understand why it wasn't included in Level II or Level III.

Save Programming Time

Considerable programming time can be saved by keeping a cassette tape file of commonly used subroutines and merging them into your programs as you

need them.

One subroutine that complements Merge is shown in Program Listing 3. It computes and displays the length of any program currently in memory. If several programs have been merged, the display will reflect the total length of the composite program. Merge the subroutine into memory and run or GOTO 60000.

The usual ?15562-MEM doesn't always yield the same number. The number displayed before running a program is not the same as the number displayed after running it. Any program, run either from the keyboard in command mode or through the interpreter, requires about 10 bytes of overhead. Therefore, I subtracted from 15562, not the usual 15572 (I have a 16K system).

The subroutine first gets the start-of-variables address, which is the last byte of the resident Basic program plus two. It then subtracts the start-of-Basic address, two bytes at the end of a program, and its own length. The result of this computation is then sent to the CRT screen and printer. If your system does not include a

printer, delete the LPRINT statement.

The Game Sea

You may be drowning in a sea of game tapes. Why not merge several similar games into one program? Just write a short subroutine that asks the player which game he or she wants to play. Load the subroutine and merge all your similar games onto it.

Merge can be used the same as a CLOAD to load the root program, so you can store this subroutine with your other subroutines.

Another useful feature of Merge is that you can add and delete data lines quickly without entering them by hand.

Modular Programming

One use for the routine, possibly the most valuable, allows you to develop programs in short modules. The modular approach will save time loading and saving during the program development.

Modular programming techniques also allow easier maintenance and smoother program flow. Program sections will no longer seem to blend into each

other.

How It Works

The assembly language Program Listing 1 was written in standard Zilog Z-80 mnemonics for a Level II system. It can be assembled as shown or poked in one byte at a time using T-Bug or a similar debug monitor. The program is initially located in an area of memory that doesn't interfere with T-Bug. By using the #J 6D60 command, you can relocate the program below T-Bug, but merging in any program over 20 bytes will write over a section of T-Bug.

If you do not have access to an assembler or debug monitor, you can use the Basic program shown in Program Listing 2 to load it. The merge and relocate routines are contained in decimal form in the data lines 100 to 190. Line 10 POKes the program into the proper locations, and line 20 deletes the program, opening Basic user RAM for our use.

Merge is written in two modules. The first module relocates the merging module to the bottom of Basic's user RAM area. After relocation, this module is scrapped by letting it drift in the area of variables and strings. The second module is the actual Merge routine.

Normally, when you type and enter Merge an ?L3 error message is displayed on your CRT screen. However, Level II Basic was clearly written to allow for all kinds of expansions.

The various commands used by Level II are stored in memory in the form of a one byte code number. In this case, 168 (A8H)=MERGE. (For a list of these codes see "New Restored" and Hidden Codes & Missing Chips" in the January 1980 issue of 80 Microcomputing.)

When Basic encounters one of these code bytes, it goes to a vector list, which in effect is a GOTO table to find out where the appropriate routine is stored. The jump vector (or GOTO) for Merge, stored at memory locations 16779 (418BH) to 16780 (418DH) normally points to the ?L3 error routine at location 012DH for Level

II and 4A07H for Level III. We are going to change this jump vector to point to our Merge routine, bypassing the ?L3 error message.

Level II also maintains a list of addresses used in the normal operation of its business. The list is stored in the reserved RAM area just below Basic RAM. Table 2 is a partial list of these addresses. The address at 16548 (40A4H) and 16549 (40A5H) is where the first byte of a Basic program will start loading and one at 16633 (40F9H) and 16634 (40FAH) where variable storage starts.

The Relocation Module

Lines 00230 and 00240 get the start-of-Basic pointer from locations 40A4H and 40A5H and plug it into locations 418CH and 418DH as our new jump vector.

Basic user RAM starts at 17129 (42E9H) for Level II and at 22208 (56COH) for Level III. Because of this difference in starting locations, we must calculate the distance from where the program is to where we want it to be. The displacement value is computed in lines 00260 to 00290 by subtracting (SBC) the Basic-start-address, already in register pair DE, from the unrelocated address of the Merge module, which we put into register pair HL in line 00260. The result of this subtraction is automatically put into register HL. Save the address of the Merge module for use later by pushing it into the stack in line 00280.

Lines 00300 and 00310 transfer the displacement value from register pair HL to register pair BC. Then in lines 00320 to 00370 we get the address of the LDBYTE subroutine and subtract the displacement value to get the new LDBYTE address. Then plug it into the subroutine calls in lines 00660, 00690, 00720 and 00840. A call in assembly language is the same as a GOSUB in Basic.

Relocation of the Merge module data block will be done for us by one of those elegant commands for which the Z-80 microprocessor is famous. The LDIR command (LDIR stands for load-increment repeat) takes care of all the details of a complete

block move.

It works like this: The byte of the data located in the address pointed to by the HL register pair is moved to the address pointed to by the DE register pair. One is added to both the HL register and the DE register pair and one is subtracted from the BC register pair. The BC register pair is used as a down-

counter. We set it to the length of the Merge module (80 bytes = 50H) in line 00390. BC is then checked for zero. If it has not downcounted to zero, the cycle is repeated until a zero is found. At that time, both the HL register pair and the DE register pair are incremented one more time and the program falls through to the next program line.

```

00100 : .....
00110 : .....
00120 : .....
00130 : *          LEVEL 2 MERGE .....
00140 : *          BY BILL DALESANDRY 1980 .....
00150 : .....
6D60 00160  ORG   5060H   ; /2800H (121 BYTES)
40A0 00170  STORE EQU  40A0H ; THIS LOCATION IS RND SEED
00180 : .....
00190 : .....
00200 : *          THIS BLOCK IS THE RELOCATION MODULE .....
00210 : .....
00220 : .....
6D60 ED5DA440 00230  RELOC  LD   DE,(40A4H);PUT BASIC START IN DE
6D64 ED59BC41 00240  LD   (418CH),DE;  AND PLUG IT IN AS NEW
00250 : .....
6D68 21946D 00260  LD   HL,MERGE ; PUT ADDRESS OF UNRELOCATED
00270 : .....
6D6B E5 00280  PUSH HL ; MERGE PROGRAM IN HL AS SOURCE
6D6C ED52 00290  SBC  HL,DE ; ADDRESS AND SAVE FOR LATER
6D6E E5 00300  PUSH HL ; TRANSFER IT
6D6F C1 00310  POP  BC ; TO BC
6D70 21D66D 00320  LD   HL,LDBYTE;PUT ADDRESS OF CALL IN HL
6D73 ED42 00330  SBC  HL,BC ; SUBTRACT DISPLACEMENT
6D75 22AC6D 00340  LD   (NEXT+1),HL;PUT CORRECTED
6D78 22B16D 00350  LD   (LOAD+1),HL; CALL ADDRESS
6D7B 22B96D 00360  LD   (LOOK+1),HL; AT FOUR
6D7E 22CC6D 00365  LD   (ZERO+1),HL; CALL LOCATIONS
6D81 E1 00370  POP  HL ; POINT HL TO MERGE LOCATION
00380 : .....
6D82 015A08 00390  LD   BC,0850H ;SET COUNTER FOR 88 BYTES
6D85 E1B8 00400  LDIR ; MOVE TO NEW LOCATION
6D87 ED53A440 00410  LD   (40A4H),DE;DE NOW POINTS TO LAST PROGRAM
00420 : .....
6D8B 13 00430  INC  DE ; LIME+1 -THIS IS NEW BASIC START
6D8C 13 00440  INC  DE ; COUNT 2 MORE TO GET
6D8D ED53F948 00450  LD   (40F9H),DE; PLUG IT IN
6D91 C37A2C 00460  JP   2C7AH ;A BIT OF HOUSEKEEPING AND
00470 : .....
00480 : .....
00490 : *          THIS BLOCK IS THE MERGE PROGRAM .....
00500 : .....
00510 : .....
00520 : .....
6D94 C09302 00530  MERGE  CALL  0239H ;TURN ON CASSETTE, REAL LEADER,
00540 : .....
6D97 0684 00550  LD   B,04H ;FIND SYNC BYTE (AS), TURN ON **
0059 003502 00560  SKIP  LD   B,04H ;SKIP NEXT FOUR BYTES
6D9C 10F8 00570  DJNZ 0235H ; (3-D3 HEADERS + FILE NAME)
6D9E 323E3C 00580  LD   (SCEN),A ; FILE NAME IS IN A
6DA1 2AF348 00590  LD   HL,(40F9H);GET VARIABLES POINTER
6DA4 28 00600  DEC  HL ; SUBTRACT 2 TO GET THE STARTING
6DA5 2B 00610  DEC  HL ; ADDRESS OF THE PROGRAM TO BE
6DA6 54 00620  LD   D,H ; MERGED AND SAVE IT IN DE
6DA7 5D 00630  LD   E,L ; AS LAST 'NEXT LINE POINTER'
6DA8 2B 00640  DEC  HL ; SET HL TO START ADDRESS -1
6DA9 0E04 00650  FIRST4 LD   B,04H ;GET AND LOAD FIRST
6DAH C0D96D 00660  NEXT  CALL  LDBYTE ; 4 BYTES OF LINE (NEXT LINE
00670 : ..... ; ADDRESS AND LINE NUMBER)
00680 00680  DJNZ  NEXT ; - LOOK FOR TWO ZEROS -
00690 00690  LOAD  CALL  LDBYTE ;GET AND LOAD A BYTE
006B 20F8 00700  JR   NZ,LOAD ; IF NOT ZERO LOAD NEXT BYTE
0065 C0C202 00710  CALL 022CH ; IF ZERO -END OF LINE- BLINK *
6D8B C0D96D 00720  LOOK  CALL  LDBYTE ; THEN LOOK FOR A SECOND ZERO
00730 : ..... ; (CP USED LATER)
6D8B E5 00740  PUSH HL ;SAVE CURRENT ADDRESS POINTER
6D8C 22A840 00750  LD   (STORE),HL;STORE ADDRESS POINTER, (HL)
6D8F 21A840 00760  LD   HL,STORE ; AND POINT HL TO IT
6DC7 E0A8 00770  LDI  ;MOVE ADDRESS OF CURRENT LINE
6DC4 E0A8 00780  LDI  ; TO FIRST 2 BYTES OF LAST LINE
6DC6 E1 00790  POP  HL ;GET CURRENT MEMORY ADDRESS
6DC7 54 00800  LD   D,H ; AND PUT IT
6DC8 5D 00810  LD   E,L ; IN DE
6DC9 20DC 00820  JR   NZ,FIRST4 ; (Z FLAG STILL RESET)
00830 : ..... ; IF NZ LOAD NEXT LINE
6D8C C0D96D 00840  ZERO  CALL  LDBYTE ;LOAD NEXT BYTE
6DCE 0693 00850  LD   B,03H ; FIRST4 IS NOW FIRST3
6DD0 20D9 00860  JR   NZ,NEXT ; NOT THIRD ZERO, LOAD NEXT LINE
00870 : ..... ; END OF PROGRAM
6DD2 23 00870  INC  HL ;THIRD ZERO +1 IS THE
6DD3 22F940 00880  LD   (40F9H),HL; NEW VARIABLES START ADDRESS
6DD6 C37A2C 00890  JP   2C7AH ;ADJUST MEMORY SIZE POINTERS
00900 : ..... ; TURN OFF CASSETTE AND GO HOME
6DD9 C03502 00910  LDBYTE CALL 0235H ;GET A BYTE
6DDC 23 00920  INC  HL ;INCREMENT ADDRESS POINTER
6DDD 77 00930  LD   (HL),A ; AND LOAD THE BYTE
6DDE FE08 00940  CP   08H ; IF ZERO, SET Z FLAG
6DD0 C9 00950  RET  ; AND BACK AGAIN
6DE1 08 00960  DEFB 08H ;THESE ARE THE THREE
6DE2 08 00970  DEFB 08H ; ZEROS WHICH INDICATE THE
6DE3 08 00980  DEFB 08H ; END OF THIS PROGRAM
6DE4 08 00990  END  RELOC
00900 TOTAL ERRORS

FIRST4 6DA9
SKIP 6D99
ZERO 6DCB
LOOK 6D8B
LOAD 6D8B
NEXT 6D8B
LDBYTE 6D89
MERGE 6D94
RELOC 6D60
STORE 40A0

```

Program Listing 1.

Our Merge module has now been moved to low memory, including the three zeros indicating the end of a program. The routine sometimes crashes without them.

Register pair HL now points to one address past our routine. This address is plugged into locations 40A4H and 40A5H as

our new start-of-Basic address. We then add two by incrementing register pair HL twice and plug this address into locations 40F9H and 40FAH as our new start-of-variables address.

The only thing to do now is reset the various memory size pointers to allow for the 80 bytes just added. This chore is done

by the Level II ROM routine located at address 2C7AH. That routine also sends us back to the Level II ready prompt, and Merge is operational.

The Merge Module

To understand how the second module works, we must examine how CSAVE formats cassette tapes and how this information is loaded back into the computer as a coherent program. Save Program Listing 4 on a cassette using the file name "A".

Table 1 demonstrates the CSAVE format. The first column contains some explanatory comments. The second column is the memory location where the byte on tape will load. The third column is a representation (in hex) of the data that is contained on the cassette tape. The last column is a brief description of what the byte is or its function.

A saved tape starts with a leader of 255 zeros, then a sync byte (A5H) synchronizes the loading of all following data. Next comes a three-byte leader of three D3H bytes, followed by a one-byte file name for the following program, in this case 41H, an ASCII "A".

All the data to this point has been CSAVE housekeeping overhead and does not load into memory. The next two bytes are the first two of the program and will be the first two bytes to be loaded into memory. These bytes point to the address of the next program line. After Basic has finished with a program line, this is how it knows where to go for the next line. The two bytes are arranged in standard Z-80 format with the least significant byte (LSB) first, followed by the most significant byte (MSB). To read the address, read the last byte first (in hex).

The next two bytes are the program line number, again arranged LSB first. The following bytes in Table 1 are the various command codes and ASCII characters making up the program.

A zero indicates the end of a program line. If you have used multiple statement program lines, a zero will not be put be-

tween the statements. Instead, a 3AH byte (ASCII colon) will be there. The zero only appears at the end of a numbered program line. The end of a program is indicated by two more zero bytes following the end of line zero. These two zeros form a dummy line number. The next sequential address starts the area used for simple variable storage.

To see how Merge works, we will first call the very useful Level II ROM routine located at address 0293H. First, it turns on the cassette motor and selects default drive number one. Then it reads the 255 zero byte leader, locates the sync byte (A5H), and turns on the two asterisks in the upper right hand corner of the screen for us. Since Merge doesn't search for a particular file name, we can skip over the next four bytes in lines 00550 to 00570.

The DJNZ (decrement-jump (if) not zero) command in line 00570 creates the assembly language equivalent of a For... Next loop, using register B as a downcounter. When counting is to be done, it is always done through the B register or for counts longer than 255, through the BC register pair. In line 00550 we set register B to four (04H). When the B register has downcounted to zero, the command falls through to the next program line.

The byte in the accumulator, (register A) is the last byte loaded and the name of the program about to be merged. We can use that byte to replace the left asterisk (Listing 1, line 00580).

Next, we need to know where in memory to load the new program. Lines 00590 to 00640 give us this address by taking the start-of-variables address, which is in register pair HL and subtracting two. Register pair HL now points to the next address past the last zero byte of the last line of the resident program (see Fig. 1). This is where the program to be merged will start. We will use this address later to adjust the next-program-line pointer. For now, we will save it in register pair DE.

Later, we are going to look for the zero byte, which represents the end of a program line. If you

THESE BYTES DO NOT LOAD INTO MEMORY		00	LEADER
		00	CONSISTING OF
		00	255 ZEROS
		A5	SYNC BYTE
		D3	THREE
		D3	D3
		D3	HEADERS
		41	FILE NAME "A"
START OF BASIC STORAGE AREA	42E9H	F5	42F5H IS ADDRESS
		42	OF NEXT LINE
		0A	000AH = LINE 10
		00	
		B2	PRINT
		22	"
	42EFH	54	T
	42F0H	45	E
		53	S
		54	T
		22	"
		00	END OF LINE
	42F5H	02	4302H IS ADDRESS
		43	OF NEXT LINE
		14	0014H = LINE 20
		00	
		B2	PRINT
		22	"
		50	P
		52	R
		47	G
		4D	M
	42FFH	2E	.
	4300H	22	"
		00	END OF LINE
	4302H	00	0000H = DUMMY
		00	LINE NUMBER
START OF VARIABLE STORAGE	4304H	XX	VARIABLE TYPE
		XX	
		XX	

Table 1.

16526	408EH	ENTRY FOR USR
16539	409BH	PRINTER CARRIAGE POSITION
16540	409CH	DEVICE - TAPE=FFH VIDEO=00H PRINTER=01H
16544	40A0H	START OF STRING SPACE
16548	40A4H	START OF BASIC USER RAM
16550	40A6H	LINE CURSOR POSITION
16554	40AAH	SEED FOR RND AND RANDOM
16559	40AFH	NUMBER TYPE - INT=02H SINGLE=04H DOUBLE=08H
16561	40B1H	TOP OF BASIC MEMORY
16563	40B3H	STRING WORK AREA POINTER
16565	40B5H	STRING WORK AREA
16598	40D6H	MEMORY SIZE
16629	40F5H	LAST LINE NUMBER EXECUTED
16633	40F9H	START OF VARIABLES
16635	40FBH	ARRAYS POINTER
16637	40FDH	FREE SPACE
16639	40FFH	NEXT DATA BYTE TO BE READ
16722	4152H	LEVEL 2 VECTOR TABLE

Table 2.

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refer to Table 1, you will see that the fourth byte to come in is a zero. Avoid confusing this zero with an end-of-line zero by loading the first four bytes without a zero search in lines 00650 to 00680, using the DJNZ command again.

Lines 00910 to 00950 contain the subroutine, labeled LD-BYTE, which gets one byte of data from tape by calling the Level II ROM subroutine located at address 0235H and loads that byte into the memory location pointed to by the HL register pair.

Register pair HL is incremented by one to point to the next memory location and the last byte loaded (which is in the accumulator) is compared with zero in line 00940. If the result of this comparison is true (byte = 0), the Z flag (the seventh bit of an eight-bit binary number in the F register) will be set to one. If the result is false (byte ≠ 0) the Z flag will be reset to zero. We can now return to the main program.

Line 00700 checks the status of the Z flag. If the last byte compared was not a zero (NZ), the program jumps back to the label specified by the operand of the command. Another byte is loaded and another and another, until the last byte loaded is a zero, at which point the program falls through to line 00710, which calls a Level II ROM subroutine to blink the right asterisk.

We have found a zero that means the end of a program line. If the next two bytes are also zeros, we have arrived at

the end of the last line of the program. Now we must adjust the next-line-pointer in the first two bytes of the last line loaded to point to the last byte loaded, which is the first byte of the next line.

The LDI commands in lines 00770 and 00780 work the same as the LDIR command except it does not use the BC register pair as a downcounter. It transfers data once and only once. This way not only saves a byte of program memory, but demonstrates both commands as well. We are moving two bytes, the LSB and MSB of the address. Therefore, we must use LDI twice.

We have already put the address of the first byte of the last line, in register pair DE, back in lines 00620 and 00630. Register pair HL holds the address of the current line. We must store the current line address somewhere and point register HL to it in order for LDI to do its job. The problem is where to store it. Locations 40AAH to 40ACH hold the seed used in the random number generator for Basic's RND and Random statements. We can store the address here without worrying about interfering with any of Basic's normal functions.

With all the housekeeping done, the two LDIs move the LSB and MSB of the address to the first two bytes of the last line. Now POP the current line address out of the stack and back into the HL register pair. Lines 00800 and 00810 transfer

it to the DE register pair for later and the adjustment is complete.

The Z flag is still set or reset from the last compare. We will use the flag now to either load the next program line or look for another zero. If the zero flag test in line 00820 is true, we load another byte and set register B to 03H. This makes the First 4 routine into a First 3 routine, otherwise our downcount would be off by one if this bit isn't a zero.

If the last byte was a zero, the flag test in line 00850 will fall through to the next program line. Increment register pair HL one last time and put that address into locations 40F9H and 40FAH as the new start-of-variables pointer.

Remember the Level II ROM routine starting as address 2C7AH that was used in the relocation module? Use it again to adjust memory size to allow for the Basic program we just merged, then we are done.

The ROM routine at 2C7AH contains a call to another ROM routine at location 01F8H that turns off the cassette motor. The reason I mention this now is that many useful Level II routines contain calls to other subroutines. When using these routines, careful consideration must be given to what effect the subroutine will have on your program or the registers you are using. If the extra calls will not affect your program or registers, use them! If the subroutine affects your registers but not your program, push the registers in jeopardy into the stack and pop them back after the subroutine. Remember for every PUSH there must be a POP.

Using The Program

In response to the memory size prompt, press Enter. If you need memory for some other purpose, reserve it. If you are using Level III, load and initialize it; if not, it would be a good idea to load a line renumbering program into high memory. If you have assembled the program or punched it using T-Bug, load it using the System command. Initialize Merge by typing "/" or /28000 and pressing Enter.

If you are using the Basic program shown in Program 2,

```
10 PRINT"TEST"
```

```
20 PRINT"PRGM."
```

Program Listing 4.

CLOAD and run it. After it has run, the New statement in line 20 will clear it out of memory. Type system and press Enter, then type /28000 and press Enter. When the Ready prompt appears, you're in business.

Some Precautions

CLOAD the first program, but before merging in another program, some precautions should be observed. The next program should have line numbers higher than the line numbers of the root program. Actually the higher line numbers can be loaded first and the program renumbered but if line numbers are duplicated in the two programs, line statements such as GOTO or GOSUB will not renumber properly

If the earlier line numbers are higher, always renumber or unpredictable results can occur.

Merge does not have file selection ability. You must locate your cassette at a point just before the program to be merged. Be sure the volume on your cassette is properly set, then type Merge and press Enter. Two asterisks will appear in the upper right hand corner of your CRT screen. The left asterisk will be replaced by the file name of the program that is loading. Verify that it's the proper program. If the wrong program is loading, the routine can be aborted with the reset switch. The blinking asterisk will signal that the program is loading. When loading is complete, the ready prompt will appear. If you have loaded the wrong program, simply delete the unwanted lines and start over.

All other normal commands will operate as usual. Finally, list the composite program for a final verification that you have merged all the separate programs in the right order. Renumber the new program, if necessary, and save it on tape. ■

```
10 FOR P=28000 TO 28131:READ B:POKE P,B:NEXT
20 NEW
100 DATA 237,91,164,64,237,83,140,65,33,140,109,229,237,82
110 DATA 229,193,33,217,109,237,66,34,172,109,34,177,109,34
120 DATA 185,109,34,204,109,225,1,80,0,237,175,237,83,164
130 DATA 64,19,19,237,83,249,64,195,122,-4,205,147,2,6
140 DATA 4,205,53,2,16,251,50,62,60,42,249,64,43,43
150 DATA 84,93,43,6,4,205,217,109,16,251,205,217,109,32
160 DATA 251,205,44,2,205,217,109,220,34,171,64,33,171,64
170 DATA 237,160,237,160,225,84,93,32,222,205,217,109,6,3
180 DATA 32,217,35,34,249,64,195,122,44,205,53,2,35,119
190 DATA 254,0,201,0,0,0
```

Program Listing 2.

```
60000 ZZ$="PROGRAM BYTES =" :ZZ=(PEEK(16634)*256+PEEK(16633))-(PEEK
(16549)*256+PEEK(16548))-103:PRINTZZ$:ZZ:LPRINTTAB(10)ZZ$:ZZ
```

Program Listing 3.

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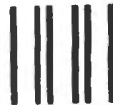
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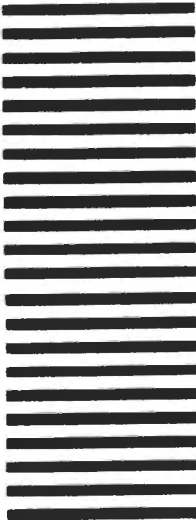
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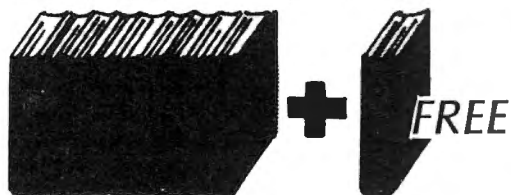
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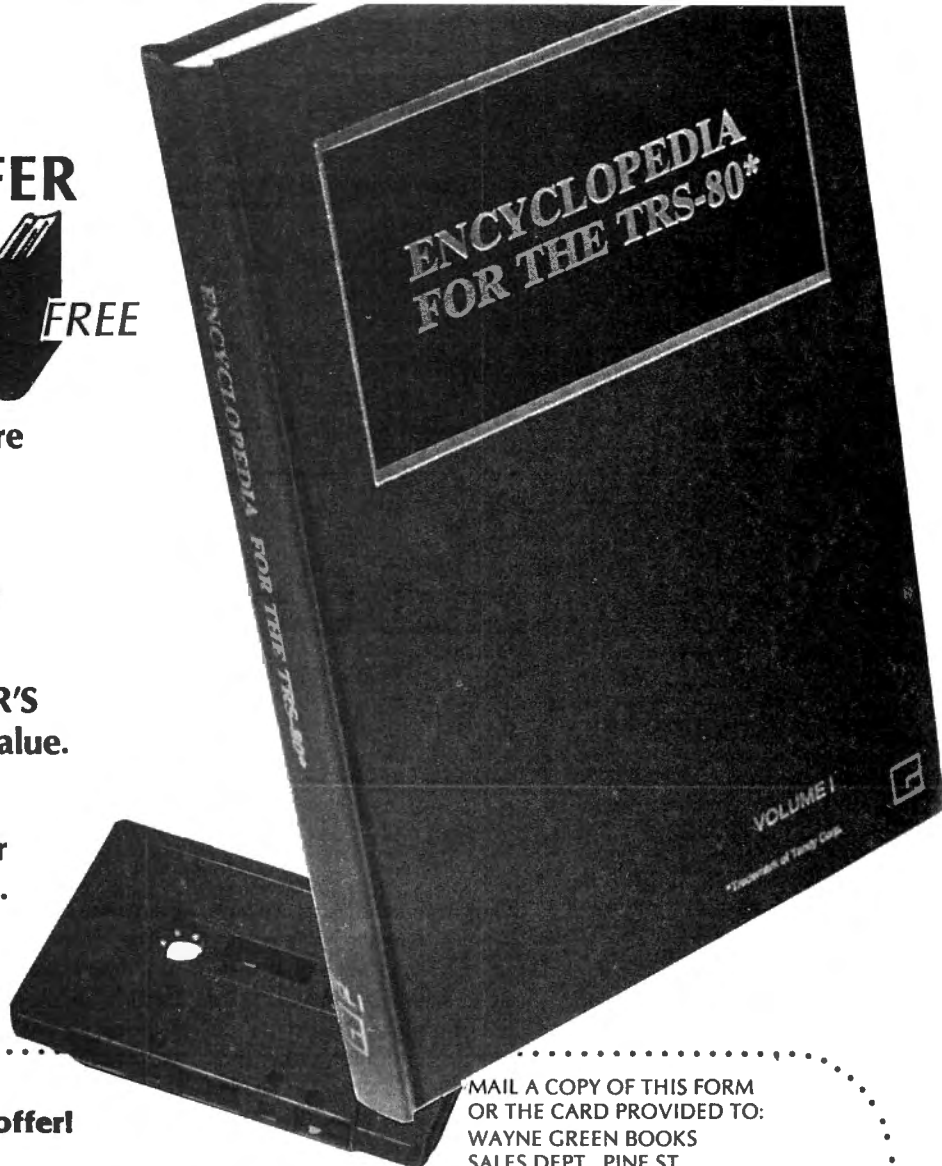
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Some Background

A major advantage of machine language routines, aside from their speed, is their permanence. Impervious to New and CLOAD commands, which wipe out a Basic program in an instant, machine code programs remain protected beyond the boundary set up by your response to the memory size query. Only an erratic POKE or a System tape loaded into the same memory locations can alter your machine code routines.

With that important distinction understood, consider a command that would be useful in our customized computer—a

Merge command. After we have loaded or typed in one program, this command will adjust some pointers. We may then CLOAD a second program which is appended to the first, rather than overwriting it. Once the second program is loaded, the Merge command must readjust a pointer before the combined pro-

grams are run.

The procedure for merging has been clarified in Roger Pape's article "Whip File Wipeouts" (*Kilobaud Microcomputing*, July 1979). My machine language version of this program is shown in Program Listing 1, lines 310-380. The comments in the listing explain

the procedure.

Once this routine is stored in memory, we simply call it rather than using the cumbersome Basic sequence of PEEKing and POKEing to merge two programs.

A New Command

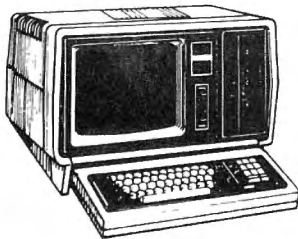
Before putting the Merge rou-

```

00100 ;*** CUSTOMIZED COMMANDS: MERGE ROUTINE *****
00110 ; DALE W. RUPERT 07/06/80
00120 ;
00130 ;THIS PROGRAM ALLOWS THE USE OF THE MERGE COMMAND
00140 ;IN LEVEL II BASIC.
00150 ;
00160 ;TO MERGE TWO BASIC PRGMS.:
00170 ; 1)HAVE FIRST PRGM. IN MEMORY
00180 ; 2) TYPE MERGE (ENTER)
00190 ; 3) CLOAD SECOND PRGM.
00200 ; 4) TYPE MERGE2 (ENTER)
00210 ;THE TWO PRGMS. ARE NOW ONE.
00220 ;
7F02 00230 ORG 7F02H ;S.A.=32514
00235 ;CHANGE LINE 240 TO RELOCATE
7F02 210B7F 00240 PATCH LD HL,START ;PATCH TO START
7F05 228C41 00250 LD (418CH),HL ;MERGE VECTOR
7F08 C37200 00260 JP 0072H ;TO BASIC
00270 ;
7F0F 7E 00280 START LD A,(HL) ;GET ARGUMENT
7F0C B7 00290 OR A ;SET FLAGS
7F0D 200B 00300 JR NZ,MERGE2 ;ARG. <> 0
00305 ;
7F0F 2AF940 00310 MERGE LD HL,(40F9H) ;NEXT LINE PTR.
7F12 2B 00320 DEC HL ;SUBTRACT 2 ...
7F13 2B 00330 DEC HL ;... FROM IT
7F14 22A440 00340 LD (40A4H),HL ;INTO FIRST LINE PTR.
7F17 C37200 00350 JP 0072H ;BACK TO BASIC
00355 ;
7F1A 21E942 00360 MERGE2 LD HL,42E9H ;NORMAL 1ST LINE ADDR.
7F1D 22A440 00370 LD (40A4H),HL ;INTO 1ST LINE PTR.
7F20 C37200 00380 JP 0072H ;BACK TO BASIC
0000 00390 END
    
```

Program Listing 1.

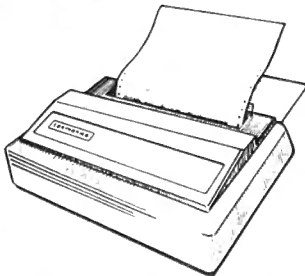
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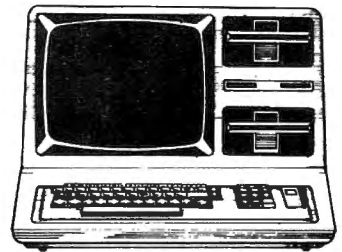
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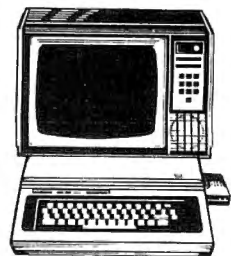
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tine into memory, consider how we might call it. The traditional methods use the System command or the USR statement. Both are satisfactory, but a better way is to use the Merge command!

In Level II, type: MERGE (enter). You didn't get a syntax error—that means the computer recognized the word merge. The computer responded to merge with an L3 ERROR. Thus, the Merge command is built into the Basic interpreter, but it is interpreted to be a Disk Basic command, not used in Level II.

In Wes Thielke's article, "ROM Routines" (80 Microcomputing, February 1980), a table of Disk Basic command vectors shows that the Merge command sends the computer to address 418BH. The three bytes beginning at 418BH (C3 2D 01) cause the computer to jump to address 012DH. This jump leads right to the L3 Error dead end in Level II Basic. If we replace bytes 2DH and 01H with 0BH and 7FH, the computer jumps to location 7F0BH whenever it encounters the Merge command. Waiting at 7F0BH is our Merge routine.

The Merge Routine

We must first patch our routine into the computer's sequence of steps. The Merge routine must put address 7F0BH into locations 418CH and 418DH. The location of this routine is arbitrary; I chose 7F0BH so it won't interfere with other routines in upper memory. If you have a 4K machine, replace 7FH with 4FH so your starting address is 4F0BH.

This patch causes the jump to our routine:

```
LD HL,7F0BH 'get our starting address
LD (418CH),HL 'store it as the Merge
vector
```

Since the Merge routine consists of two parts, one before the CLOAD and one after it, a single Merge command won't suffice. We must somehow indicate whether to jump to the first or the second part of the routine. We could do some POKING before each Merge command, but that defeats the idea of customized, built-in routines.

```

00100 ;***** CUSTOMIZED COMMANDS *****
00110 ; DALE W. RUPERT 07/06/80
00120 ;
00130 ;PROGRAM ALLOWS THE USE OF CMD0 THRU CMD7 IN LEVEL II BASIC
00140 ;TO CALL UP THE SOUNDS OF DENNIS KITSZ' BABYBEEP PRGM.
00150 ;IN '80 MICROCOMPUTING, 4/80, P. 68
00160 ;
00170 ;
00180 ;
7E30 00190 ; ORG 7E30H
00200 ;
7E30 21397E 00210 PATCH LD HL,START ;PATCH TO S.A.
7E33 227441 00220 LD (4174H),HL ;CMD VECTOR
7E36 C37200 00230 JP 0072H ;TO BASIC
00240 ;
7E39 23 00250 START INC HL ;NEXT BASIC LOC.
7E3A E5 00260 PUSH HL ;SAVE IT
7E3B FE30 00270 CP 30H ;ARG. < "0" ?
7E3D FA557E 00280 JP M,NEXT ;INVALID ARG.
7E40 FE38 00290 CP 38H ;IS ARG.>ASCII"7"?
7E42 F2557E 00300 JP P,NEXT ;ARG. > 7
7E45 D630 00310 SUB 30H ;GET VALUE 0 - 7
7E47 21577E 00320 LD HL,TABLE ;START OF TABLE
7E4A 85 00330 ADD A,L ;GET TABLE POSITION
7E4B 6F 00340 LD L,A
7E4C 5E 00350 LD E,(HL) ;GET LSB
7E4D 167D 00360 LD D,7DH ;BABYBEEP STARTS AT 7D00H...
00370 ;
7E4F 21557E 00380 LD HL,NEXT ;RETURN ADDRESS
7E52 E5 00390 PUSH HL ;SAVE IT
7E53 D5 00400 PUSH DE ;SET UP INDIRECT...
7E54 C9 00410 RET ;...SUBROUTINE CALL
7E55 E1 00420 NEXT POP HL ;RESTORE BASIC PTR.
7E56 C9 00430 RET ;BACK TO BASIC
00440 ;
7E57 00 00450 TABLE DEFB 00H ;PHASER (7D00H)
7E58 14 00460 DEFB 14H ;BEEPS (7D14H)
7E59 34 00470 DEFB 34H ;DOODLES (7D34H)
7E5A 57 00480 DEFB 57H ;FANFARE (7D57H)
7E5B B8 00490 DEFB 0B8H ;SIREN (7DB8H)
7E5C DF 00500 DEFB 0DFH ;1 BLOOP (7DDFH)
7E5D ED 00510 DEFB 0EDH ;1 BLEEP (7DEDH)
7E5E FB 00520 DEFB 0FBH ;RASPBERRY (7DFBH)
00530 ;
00540 ;
0000 00550 END
00000 TOTAL ERRORS
```

Program Listing 2

Here is one solution. Consider the command mode statement: MERGE2. The computer first interprets the Merge command, and the two is then stored in the A register as 32, its ASCII code.

See for Yourself

To observe this process, using T-Bug:

- Put 0BH into 418CH and 7FH into 418DH (type M 418C 0B 7F); type X.
- Put a breakpoint at 7F0BH (type B 7F0B).
- Exit to Basic (type J 0072 or use the Reset button); clear.
- Type and enter: MERGE2. The computer goes to 418BH then to 7F0BH.
- The breakpoint puts you back into T-Bug. Type F to replace the breakpoint; then type R to display the registers. Notice the address in the HL register pair. (Also note the 32 in the A register.)
- Type M and the HL address to see 32H, the ASCII value for two.

Consequently, if we use Merge and Merge2, we can distinguish between our first and second entries to the routine. The following statements determine whether or not there is a non-blank character, such as 2, immediately after the word Merge:

```
LD A,(HL) 'get chr. after Merge
OR A 'set flags
JR NZ,MERGE2 'if non-blank, jump to
part two
... 'otherwise do part one
here
```

- Thus, if nothing follows the word Merge, the computer executes part one. If anything, such as two, follows the word Merge, there is a branch to part two. The complete Merge programs and patch are shown in Listing 1. You can use T-Bug to make a System tape of this program:
- Use the M command to store the program in memory (type M 7F02, then type the numbers in column two of the Listing: 21 0B 7F 22. . . etc.)
 - Use the command P 7F02

7F22 7F02 MERGE to make a tape.

The starting addresses for the eight sound subroutines in Kitsz' program are shown in Listing 2. The CMD vector address is 4173H. Listing 2 first sets up the patch to our program. It then decodes the argument following the CMD, and finally calls the appropriate subroutine in the Babybeep program. The final return takes us back to the Basic program which continues from where it left off.

With this and the Babybeep programs in memory, you can generate a sound in the command mode by entering: CMD0.

Even more useful, you can use the CMD command within any of your Basic programs. This simple program demonstrates some of the possibilities:

```
10 PRINT "PHASER"
20 CMD0
```

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Program Listing 3.

30 PRINT "SOME OTHER SOUNDS":
 CMD1: CMD2: CMD3
 40 CMD7: PRINT "HOW'S THAT!!!"

```

00100 ;***** CUSTOMIZED COMMANDS *****
00110 ;       DALE W. RUPERT  07/06/80
00120 ;
00130 ;PROGRAM ALLOWS THE USE OF CMD0 THRU CMD9 IN BASIC
00140 ;TO CALL UP THE SOUNDS OF DENNIS KITSZ' BABYBEEP PRGM.
00150 ;IN '80 MICROCOMPUTING, 4/80, P. 68
00160 ;
00170 ;SECOND PART OF PROGRAM ALLOWS THE USE OF CMDA THRU CMDZ
00180 ;TO CALL UP SUBROUTINES WITH ADDRESSES STORED IN TAB2.
00190 ;THE ADDRESSES ARE STORED WITH LSB FIRST AND MSB LAST.
00200 ;       FOR EXAMPLE, CMDA WILL CALL THE SUBRTN.
00210 ;       AT LOC. 7D00H IF 00H IS STORED IN (TAB2+0)
00220 ;       AND 7DH IS STORED IN (TAB2+1).
00230 ;
00240 ;       CMDB CALLS THE SUBRTN. WITH ADDRESS STORED
00250 ;       IN (TAB2+2) AND (TAB2+3).
00260 ;
00270 ;       *****
00280 ;       CMDZ CALLS THE SUBRTN. WITH ADDRESS STORED
00290 ;       IN (TAB2+50) AND (TAB2+51).
00300 ;
7E30 00300      ORG      7E30H
00310 ;
7E30 3A7341    00320  PATCH  LD      A,(4173H)      ;CMD VECTOR
7E33 324A7E    00330      LD      (STORE),A      ;SAVE IT
7E36 2A7441    00340      LD      HL,(4174H)      ;
7E39 224B7E    00350      LD      (STORE+1),HL
7E3C 3EC3      00360      LD      A,0C3H      ;'JP '
7E3E 327341    00370      LD      (4173H),A
7E41 214D7E    00380      LD      HL,START
7E44 227441    00390      LD      (4174H),HL
7E47 C37200    00400      JP      0072H      ;BACK TO BASIC
00410 ;
0003 00420  STORE  DEFS   3          ;OLD VECTOR STORAGE
00430 ;
00440 ;** DECODE CMD 0 THRU CMD 9 **
00450 ;
7E4D E5        00460  START  PUSH   HL          ;SAVE BASIC POINTER
7E4E D5        00470      PUSH   DE
7E4F F5        00480      PUSH   AF
7E50 FE30      00490      CP      30H          ;IS ARG. < "0"?
7E52 F25B7E    00500      JP      P,OK        ;NO. CONTINUE
7E55 F1        00510  QUIT   POP    AF          ;RESTORE REG'S.
7E56 D1        00520      POP    DE
7E57 E1        00530      POP    HL
7E58 C34A7E    00540      JP      STORE      ;RESTORE HL
7E5B FE3A      00550  OK     CP      3AH          ;USE OLD VECTOR
7E5D F26C7E    00560      JP      P,GT9      ;IS ARG.>ASCII"9"?
7E60 D630      00570      SUB    30H          ;ARG. > 9
7E62 218F7E    00580      LD      HL,TABLE    ;GET VALUE 0 - 9
7E65 85        00590      ADD    A,L          ;START OF TABLE
7E66 6F        00600      LD      L,A          ;GET TABLE POSITION
7E67 5E        00610      LD      E,(HL)      ;GET LSB
00620 ;       PUT MSB INTO D REG. IN THE NEXT LINE
7E68 167D      00630      LD      D,7DH      ;(BABYBEEP STARTS AT 7D00H)
7E6A 1818      00640      JR      GO          ;SBTRN. ADDR. IN DE
00641 ;
7E6C FE41      00642  GT9   CP      'A'          ;VALID ARG.?
7E6E FA557E    00643      JP      M,QUIT      ;QUIT IF NOT
00644 ;
00650 ;** DECODE CMD A THRU CMD Z **
00651 ;
00659 ;***CHANGE THE COMPARISON BYTE IN THE NEXT LINE TO EQUAL
2 ***
7E71 FE42      00660      CP      'B'          ;VALID ARG.?
00661 ;
7E73 CA797E    00662      JP      Z,OK1      ;ARG. IS VALID
7E76 F2557E    00670      JP      P,QUIT      ;INVALID ARG.
7E79 D641      00680  OK1   SUB    41H          ;GET 0-25 FROM A-Z
7E7B 07        00690      RLCA          ;DOUBLE IT
7E7C 21997E    00700      LD      HL,TAB2     ;START OF TABLE 2
7E7F 85        00710      ADD    A,L          ;TABLE POSITION
7E80 6F        00720      LD      L,A          ;HL HAS TABLE LOC.
7E81 5E        00730      LD      E,(HL)      ;GET LSB
7E82 23        00740      INC    HL
7E83 56        00750      LD      D,(HL)      ;GET MSB
00760 ;
7E84 218A7E    00770  GO     LD      HL,NEXT     ;RETURN ADDR.
7E87 E5        00780      PUSH   HL          ;SAVE IT
7E88 D5        00790      PUSH   DE          ;SET UP INDIRECT...
7E89 C9        00800      RET          ;...SUBROUTINE CALL
7E8A F1        00810  NEXT  POP    AF          ;RESTORE REGS.
7E8B D1        00820      POP    DE
7E8C E1        00830      POP    HL          ;RESTORE BASIC POINTER
7E8D 23        00840      INC    HL          ;NEXT LOCATION
7E8E C9        00850      RET          ;BACK TO BASIC
00860 ;
00870 ;*** USE THIS TABLE FOR SUBRTNS. IN SAME PAGE OF MEMORY ***
00880 ;       TABLE STORES LSB : D REG. CONTAINS MSB (7DH)
00890 ;
7E8F 00        00900  TABLE  DEFB   00H      ;PHASER      CMD0
7E90 14        00910      DEFB   14H      ;BEEPS      CMD1
    
```

Program continues

Total Flexibility

Two shortcomings of the previous program are: the eight decoded arguments are already used, and all the addresses must be in the same page of memory, that is, the most significant byte of each address is the same (7DH).

One final modification of the argument-decoding and table-lookup scheme will make this program even more useful. If all of our machine language subroutines are not in the same page of memory, we need a two-byte address table to locate them. Listing 3 allows us to create such a table. Furthermore, this program may be used with Disk Basic.

This program decodes arguments 0-9 (used with the Babybeep subroutine) and arguments A-Z. For arguments A-Z, the program calls the subroutine identified by the two-byte address in the second table (TAB2). For the example shown in Listing 3, CMDA calls the subroutine at 7D00H, and CMDB calls the subroutine at 7D14H. After executing the subroutine, the computer jumps back to Basic for the rest of the program.

The Inner Workings

Let's take a brief look at Listing 3. First read the comments and get an overall view of it.

Decoding arguments A-Z begins at line 650. A is stored as an ASCII 41, B is 42, ..., and Z is 5A with all numbers in hexadecimal. Subtracting 41H from each value gives a range from 0-19H, or 0-25 in decimal. Doubling this result (line 690) allows two places in the table for each argument's address. Thus, positions zero and one correspond to A, two and three are for B, ..., and 50 and 51 belong to argument Z.

After adding the table's starting address to the argument's value (line 710), the program puts the least significant byte (LSB), then the most significant byte (MSB), into the DE register pair.

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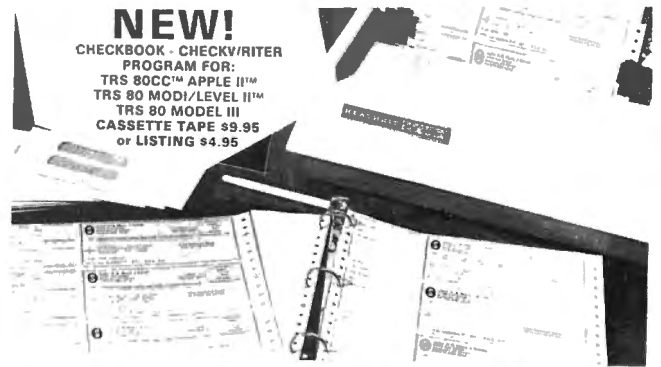
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Program continued

```
7E91 34      00920      DEFB  34H      ;DOODLES      CMD2
7E92 57      00930      DEFB  57H      ;FANFARE      CMD3
7E93 B8      00940      DEFB  0B8H     ;SIREN        CMD4
7E94 DF      00950      DEFB  0DFH     ;1 BLOOP      CMD5
7E95 ED      00960      DEFB  0EDH     ;1 BLEEP      CMD6
7E96 FB      00970      DEFB  0FBH     ;RASPBERRY    CMD7
7E97 00      00980      DEFB  00H      ;PHASER       CMD8
7E98 00      00990      DEFB  00H      ;PHASER       CMD9
              01000 ;
              01010 ;TAB2 STORES LSB THEN MSB OF ADDRESS
              01020 ;
7E99 00      01030 TAB2 DEFB  00H      ;LSB          CMD A
7E9A 7D      01040      DEFB  7DH      ;MSB
7E9B 14      01050      DEFB  14H      ;LSB          CMD B
7E9C 7D      01060      DEFB  7DH      ;MSB
              01070 ;
              01080 ; *****
              01090 ; EXTEND THIS TABLE AS NEEDED FOR MORE SUBRTN. ADDRESSES
              01100 ;
7E30          01100      END    PATCH  ;STARTING ADDRESS IS 'PATCH'
```

An Underhanded Call

The section labeled Go is the least straightforward part of the program. We have the address of the subroutine to be called in DE. Unfortunately, there is no CALL (DE) command for the Z-80. But the solution is not difficult: Put the DE address onto the stack (PUSH DE), then execute a return statement.

Consider what the return statement does. It POPs the two-byte address from the top of the stack into the program counter, and the computer jumps to that address. But once we've gone to the subroutine, how do we get back?

A normal Call would PUSH the return address onto the stack before jumping to the subroutine. Now we must do that.

In line 780, we PUSHed the address labeled Next onto the stack. In the meantime, the DE address has been PUSHed and POPped, so the Next address is now on top of the stack. The return statement in the called subroutine POPs the Next address and jumps back to the calling program.

Finally, the Basic pointer, which we PUSHed in line 460, is restored to the HL registers and the other registers are restored. The final return statement jumps back to Basic.

I normally load this program when I first start up the computer. Answer the memory size question with 32513 (7F01H) or less. Type and enter: SYSTEM and MERGE. Once the program is loaded, type and enter "I". The first part of the program im-

mediately loads the patch and returns to Basic.

Now whenever you wish to merge two Basic programs follow this simple procedure:

- Have the first program in memory.
- Type and enter: MERGE. The ready signal quickly appears.
- Type and enter: CLOAD to load the second program.
- Type and enter: MERGE2 when it is done loading.

Now your two programs are one. Note that the line numbers of the second program must be higher than those of the first program.

We have created a new command for our computer. Once its code is in memory, you may use it as any other command. This routine is so simple and so useful, you will wonder why it was not part of the original commands.

Adding Versatility

The simple decoding scheme in the Merge routine allowed only two subprograms to be distinguished. A more selective method for decoding the argument would greatly enhance our use of the built-in Disk Basic commands. For example, we could use the CMD command with a one-character argument (CMD3, CMDF, and so forth) to call 36 different subroutines (0-9 and A-Z).

As an example, we will use the CMD command to call up various sound-generating subroutines. Dennis Kitz's article, "Babybeep" (80 *Microcomputing*, April 1980) tells how the TRS-80 can produce a variety of

spectively.

For readers who are not assembly language enthusiasts, I have included Basic programs in Listing 4. These may be used in Level II only, not Disk Basic. They POKE the Merge routine (Listing 4a) and the CMD 0-7 routine (Listing 4b) into memory. Once the Basic programs are run, they delete themselves. The routines remain in protected memory, however, until the power is shut off.

A Challenge

This article has developed a procedure that creates additional Basic commands and functions. The format of Listing 3 may be used in either Level II or Disk Basic. There are also many other Disk Basic commands available.

You could further customize your TRS-80 with a screen-fill command, a decimal/hex converter, a pause command, a register display command, a search function.

You could also write routines which manipulate, rather than merely decode, the arguments. How about a memory dump called by CMD D 4200,4500, for example? Or CMD V 2,8 which clears lines 2-8 of the screen?

You are no longer limited to the Level II Basic commands! ■

sounds. By using Kitz's sound subroutines along with the customizing methods in this article, we will be able to produce a phaser sound as easily as typing CMD0.

Make It Work

I suggest you put Babybeep into memory from 7D00H to 7E2FH. Then enter Listing 3 into locations 7E30H to 7E9CH. To make a System tape with T-Bug, type: P 7D00 7E9C 7E30 CUSTOM. Use memory size 31999.

You later change the values in TAB2 to call your own custom commands. As written, CMDA and CMDB generate the phaser (7D00H) and beeps (7D14H) re-

```
1  '*** CUSTOMIZED COMMANDS ***
4  '
5  ' MERGE ROUTINE: MEM. SIZE? 32522 (OR LESS)
6  '
10 POKE 16780,11: POKE 16781,127 'PATCH
15 FOR M=32523 TO 32546: READ B: POKE M,B: NEXT
20 DATA 126,183,32,11,42,249,64,43,43,34,164,64
25 DATA 195,114,0,33,233,66,34,164,64,195,114,0
30 DELETE 1-30
```

Program Listing 4.

```
1  '*** CUSTOMIZED COMMANDS ***
4  '
5  'LEVEL II BASIC VERSION OF LISTING 2: CMD0-CMD7
6  '   YOU MUST HAVE BABYBEEP IN MEMORY
   BEFORE USING CMD0 THRU CMD7
7  '
10 POKE 16756,57: POKE 16757,126 'PATCH
15 FOR M=32304 TO 32350: READ B: POKE M,B: NEXT
20 DATA 33,57,126,34,116,65,195,114,0,35,229,254
25 DATA 48,250,85,126,254,56,242,85,126,214,48
30 DATA 33,87,126,133,111,94,22,125,33,85,126,229
35 DATA 213,201,225,201,0,20,52,87,184,223,237,251
40 DELETE 1-40
```

Program Listing 4a.

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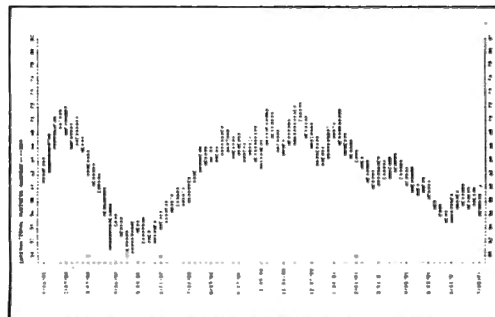
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In Command

Jerry Rutledge
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How powerful a tool can the command mode be? Recently I was writing a program that would be used only one time. It involved two different lists of 275 insurance agents (by four digit agent code numbers, like 1473). Some agents appeared on both lists and on one of the lists, some agents appeared as many as three times.

The idea was to sort through the two lists and delete all of the numbers that appeared more than once and find out who on the second list was not on the first list. Since the lists were not in numerical order, I figured it would be quicker to write a short program and input all 550 numbers into data statements than attempt to go through the lists manually.

It would have been, too, except that my novice programming ability got in the way. When you're writing your own sorting or comparing program, the TRS-80 is not the fastest computer in the world. Consider that this program was comparing one array of 275 elements with another of equal size. That means between 50,000 and 75,000 comparisons—a process that took about an hour.

The sort went without a

hitch, and as I sat waiting for the printer to begin the final printout, there suddenly appeared on the screen one of those ghastly, dreaded error messages:

```
SUBSCRIPT OUT OF RANGE IN 2640
```

I made three attempts to detect where I had gone wrong in dimensioning those arrays. Each re-run meant a one hour wait for that dismal sort, and each time the same error message happened. When it appeared the third time, I did not immediately return to the edit mode to look at line 2640 again. Had the computer done the sort properly? Were the new arrays loaded properly after all of those doubled up numbers had been deleted? Why not ask and see? So I entered: PRINT A(275).5260. Voila! There it was just waiting to be printed out. If the computer will print on the screen in command mode, why won't it LPRINT the same way? Well, it will: LPRINT A(275). And sure enough, the printer clacked out 5260.

Thoroughly frustrated at this point, I figured nothing could be worse than sitting through another sort, so I began LPRINTA(1), then LPRINTA(2), etc. After typing that command about five times another thought struck me: Would the command mode respond to a For...Next statement and multiple commands? Only one way to find out: FOR X=1 TO 10:LPRINTA(X);

NEXT X. Sure enough, out came the first 10 numbers. The rest was easy.

Since some of the array elements were equal to zero (their numbers having been deleted in the sorting process) I did not want to print those. I also wanted the list numbered so I didn't have to count the printed lists. Could all that be done in one set of command mode statements? You bet... here's how it looked:

```
C=1: FORX=1TO275: IFA(X)=OTHEN-  
NEXT X ELSELPRINTC," ";A(X):C=C+1:  
NEXTX
```

In less than two minutes I had my listing that I had been sweating for over four hours. It took about 30 seconds more to rewrite the command to print out array B, and another two minutes to print it.

I quickly typed New to wipe out any lingering memory of the experience. Later, mellowed by a couple of cans of beer, it occurred to me that it had been a valuable learning experience. Almost any string of commands can be used in the command mode provided they don't exceed the 256 byte limit.

Beware of the Edit Mode

Like all good things, there is a caveat and a limit to using a trick like this. There are at least two Level II situations where your '80 will set all of your stored variables back to zero. One is when you type Run and

begin a program, and the other is when you execute into the edit mode.

Thus, if you are running a program which crashes on an error where your computer automatically puts you in the edit mode (such as a syntax error), your variables are automatically set back to zero and this trick will not work.

A Fix

If you like to hedge, there is a simple way to avoid the automatic execution into the edit mode when errors occur. For example, suppose you have written this simplistic program:

```
10 INPUT A,B,C  
20 D=A*B*C  
30 E=D/C  
40 PRINTE
```

Take the program listed above and change line 40 so there will be a syntax error: 40 PLINTE. Now run the program. There's the syntax error, big as life, and you're left in the edit mode on line 40. Hit Enter so that you are back in the command mode and see what happens when you ask: PRINT E. 1. See, you've lost everything, right? Now add the following two lines to your program:

```
5 ON ERROR GOTO 1000  
1000 PRINT"ERROR"  
(Enter and Run)  
RUN  
? 2,3,4  
ERROR  
NO RESUME IN 1000
```


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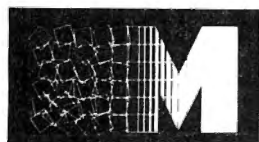
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*Data source: Epson MX-80 Operation Manual



Now you know that there was an error in your program and you have also created a No Resume error in line 1000. But note that this error has not automatically put you back in the edit mode.

Now try the command, Print E (or D, A or any of the other variables), and there they are. Note that the Print "Error" line must be the last line of your program. Even adding the word End to line 1000 will put you back in the edit mode!

You're probably saying to yourself at this point, "That's fine for a small program like this one, but if my program has 250 lines in it and there is an error, how would I know if enough of the program has executed that I could retrieve all the variables in the command mode?" Good question. And there is an answer.

In your *Level II Reference Manual* there are two error-routine functions, ERR and ERL, and up to now they looked to me like interesting but

relatively useless functions. ERL returns the line number in which the error occurred and ERR returns the code number of the error. So, let's change line 1000 to read:

```
1000 PRINT "ERROR LINE";ERL;" ER-
ROR CODE";ERR/2 + 1
(Run)
? 2,3,4
ERROR LINE 40 ERROR CODE 2
NO RESUME IN 1000
```

And there you have it, a syntax error in line 40 without being dropped into the edit mode (look up the error code number in the Appendix). In Disk Basic there may be a way of printing out the actual error message using the Error function described on page 7-6 of the *Disk Manual*, but so far it has eluded me.

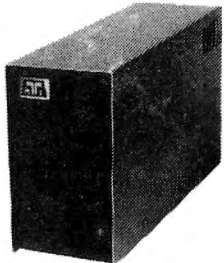
At any rate, perhaps you have discovered some ideas for different ways to use the command mode. If you're lucky, you may never need to use them, but there is a lot of power there at your fingertips. ■



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gramming language; or teachers use them to ease paperwork burdens. Many vendors have attempted to answer the first two needs—this article will help you begin resolving the third.

The programs included have been tested for two marking periods. I have received positive comments from colleagues, administrators, and parents for the increase in communication made possible by them. The exciting part of this is that I have been able to save time in the process!

The package consists of seven modules (each module is actually a separate program):

- The Data Base Builder
- The Grading Program
- The File Update
- The Section Roster Printer
- The Data Base Display
- The Grade Book Printer
- The Failure Notice Printer

Data Base Builder

The data base is actually a data file; it contains information on every student I have during a marking period. Usually that amounts to about 120 (there's room for 150). After the program has been loaded and run, the title page is displayed followed by instructions to list the requested information. You should enter the names of your students one at a time, with their sex (M/F), and section number. Once all the names are entered, you create a new student whose last name is End.

Once this name has been entered the program will direct you to place your data tape in the cassette recorder; press play and record and enter. Your entire list will be recorded on tape. This is the last time you will have to type this information. All other programs in this package are designed to read and/or rewrite this file. For your data tape use a high quality tape that won't lose data. It must also be long enough to handle the file. I presently have 117 students, which takes about seven min-

utes of tape.

There are some important flags built into this file. The End flag mentioned above is used to terminate reading the tape. Another is the section number. In my school, the student population is divided into five clusters which are labeled A,B,C,D,E. Each cluster has at least one grade and three to four homerooms in each grade. For example, a student's section might be 6A1, meaning he or she is a 6th grader in A cluster, homeroom number 1. Within a teaching section, all students will be of the same grade and cluster but may not be of the same homeroom (see Table 1). The programs that use the data file look for a change in either of the first two places of the section in order to know that it is now looking at the beginning of a new section. In the discussion of the other programs, you will see how this operates.

I have structured the programs to make modifications as simple as possible.

The data base builder is used once to establish a new list of students. Any changes thereafter can be made by the file update program.

File Update

One program I've found to be an absolute necessity is the file

```

10 REM *BUILD DATA BASE (INTERFACES WITH ALL OTHER MODULES)*
20 CLEAR 4800:CLS:PRINT@85,**DATA BASE BUILDER**:PRINT:PRINTST
RINGS(63,**):PRINTTAB(26)"WRITTEN FOR":PRINTTAB(21)"NORTHERN MI
DDLE SCHOOL":PRINTTAB(31)"BY":PRINTTAB(25)"ROGER J HEDDEN":PRINT
@982,**ALL RIGHTS RESERVED";:GOSUB1010:CLS
30 DIM LNS(150),FS(150),MFS(150),SCS(150)
31 STU=0
40 PRINT"LIST THE INFORMATION REQUESTED, PLEASE":PRINT
50 FOR I=1TO150
60 INPUT"LAST NAME: ";LN$(I):STU=STU+1
65 IF LN$(I)="END" THEN GOTO 150
70 INPUT"FIRST NAME: ";F$(I)
80 INPUT"SEX(M/F): ";MFS(I)
90 INPUT"SECTION: ";SCS(I)
100 PRINT
120 NEXT I:CLS
150 PRINT"LOAD BLANK CASSETTE AND PRESS RECORD & PLAY.":PRINT
160 INPUT"ONCE LOADED, PRESS ENTER.":G$:CLS
161 PRINT"THE FOLLOWING DATA IS BEING PLACED ON THE DATA BASE TA
PE.":PRINT
170 PTS=0:PP=PTS
180 FOR I=1TOSTU
181 PRINT"NAME: ";LN$(I);", ";F$(I)
182 PRINT"SEX: ";MFS(I)
183 PRINT"SECTION: ";SCS(I):PRINT
190 PRINT*-1,LN$(I),F$(I),MFS(I),SCS(I),PTS,PP:NEXT I
200 CLS:PRINT"LOAD COMPLETE.":PRINT:PRINT:PRINT
210 INPUT"IS THERE ANOTHER SECTION(Y/N)":G$
220 IF G$="Y" THEN GOTO 20
230 CLS:END
1000 END:'TIMER DELAY
1010 FOR ZZ=1TO1000:NEXT:RETURN
    
```

Program Listing 1. Data Base Builder.

update. This program allows you to add a new student, delete one who has left, and change any field in any record of the file. When all changes have been made, the updated file is saved on tape.

When you record this new data, use the other side of the tape. This is wise, because if something should happen during the recording phase of the program (@?#*&!) only the most recent data would be lost. Also, make a note on the cassette to remind you which side has the most recent data on it. If you go back later to use a program and, as the tape is being read, it encounters a bad record in the file, one of two error messages will be displayed—OD? or FD? Relax, type CONT and (enter). The program will resume. That record will be lost but you can put it back in with the update. If you find you are getting a lot of error messages, check the volume, clean the heads, or beat your head against the wall, but don't

give up!

You only have to run the program to see how it works. All the instructions are presented on the video screen to lead you through the program. Be sure you read these carefully. Also, when you add a name, a graphics block is displayed on the screen to indicate that the changes are being made. You may notice a period when the indicator stops changing. This occurs because the computer is searching for more string space. Be patient.

The Grading Program

The grading program is based on a few simple concepts. Over a period of time a teacher gives tests, quizzes, homework and class assignments, all of which are graded and recorded in a grade book. Most teachers like to weight these grades—that is, a test counts more than a quiz, a quiz more than an assignment. This program allows for weight-

ing. scored 15 out of 20 points on a quiz, four out of five on an assignment, and was absent for a second quiz. How would the program handle these grades? When the program starts up, it prompts you to place the data file in the cassette player. The

file is then read. At this point, go get a cup of coffee and relax. For my 117 students, it takes just over seven minutes. If you have a faster I/O device, consider yourself lucky.

Once the tape file has been read, a grade book will be dis-

NORTHERN MIDDLE SCHOOL			
Science—Hedden	SECTION ROSTER		Cluster A
Able	I. M.	EA2	50
Crab	John	EA1	60
Drab	Sam	EA3	100
Drools	Mike	EA5	81
Falls	Water	EA1	50
Money	Owen	EA3	86
Dolly	Plano	EA2	90
Farce	Polly	EA1	94
Toys	Attic	EA3	61

SECTION ROSTER				Cluster B
Frog	Kermit	6B5	89	
Goose	Father	6B3	98	
Hassle	Adam	6B7	51	
Kong	King	6B3	25	
Load	Cigar	6B8	58	
Anna	Annie	6B1	78	
Disco	Debbie	6B3	84	
Katz	Kitty	6B2	85	
Strain	Adel	6B2	69	

Table 1.

```

10 REM *FILE UPDATE FROM DATA BASE*
15 CLEAR 4000
20 CLS:PRINT@88,"**FILE UPDATE**":PRINT:PRINT STRING$(63,""):PR
INTTAB(26)"WRITTEN FOR":PRINTTAB(21)"NORTHERN MIDDLE SCHOOL":PRI
NTTAB(31)"BY":PRINTTAB(25)"ROGER J HEDDEN":PRINT@982,"**ALL RIGHT
S RESERVED";
30 DIM LN$(150),F$(150),MF$(150),SC$(150),PTS(150),PP(150):GOSUB
1010
40 CLS:PRINT@512,"LOAD YOUR TAPE TO BE UPDATED.":INPUT"THEN PRES
S 'ENTER'";A$:GOSUB2010
60 CLS:PRINT"ENTER THE APPROPRIATE CODE":PRINT:PRINT"ADD NEW REC
ORD - ENTER A":PRINT"DELETE A RECORD - ENTER D":PRINT"CORRECT
A RECORD - ENTER C":PRINT"SAVE CHANGES - ENTER S":PRINT:PRINT"Y
OUR CHOICE PLEASE";
70 G$=INKEY$:IF G$=""THEN 70
80 IF G$="A"THEN GOSUB3010:GOTO120
90 IF G$="D"THEN GOSUB4010:GOTO120
100 IF G$="C"THEN GOSUB5010:GOTO120
105 IF G$="S" THEN GOTO 130
110 PRINT@384,"HMM - TRY THAT AGAIN":GOSUB 1010:PRINT@384,"YOUR
CHOICE PLEASE
120 PRINT"ARE THERE MORE RECORDS TO BE CHANGED (Y/N)?"
121 A$=INKEY$:IFA$=""THEN121
122 IF A$="Y"THENGOTO60
123 IF A$="N"THEN CLS:GOTO110
130 CLS:PRINT"PREPARE DATA TAPE AND HIT ENTER":INPUT A$
135 CLS:PRINT"LOADING"
140 FOR S=1TOSU
150 PRINT@-1,LN$(S),F$(S),MF$(S),SC$(S),PTS(S),PP(S)
155 PRINT@916,"RECORDS WRITTEN =";S;
160 NEXT S
165 PRINT@-1,"END","OP","FILE","DATA",1,1
170 CLS:PRINT"JOB COMPLETE"
180 END
1000 END:"TIMER DELAY
1010 FOR ZZ=1TOL000:NEXT:RETURN
2000 END:"READ DATA TAPE
2010 FOR S=1TOL150
2020 INPUT@-1,LN$(S),F$(S),MF$(S),SC$(S),PTS(S),PP(S):SU=S
2025 PRINT@90,"RECORDS READ =";S;
2030 IF LN$(S)="END" THEN RETURN
2040 NEXT S: RETURN
3000 END:"ADDS NAME TO FILE
3010 CLS:PRINT"PLEASE LIST NAME OF PERSON IMMEDIATELY PRECEDING
NEW ENTRY":INPUT"LAST NAME:";FL$:INPUT"FIRST NAME:";FF$
3020 CLS:PRINTCHR$(23):PRINT"SEARCHING - PLEASE WAIT"
3030 FOR S=1TOSU:C=S
3040 IF LN$(S)=FL$ AND F$(S)=FF$ THEN 3060
3055 NEXT S
3060 CLS:PRINT LN$(C),"",F$(C)," SECTION:";SC$(C)
3070 PRINT:PRINT"ENTER NEW NAME AND INFORMATION:"
3080 INPUT"LAST NAME";N$:INPUT"FIRST NAME";N$:INPUT"SEX(M/F)";S
X$:INPUT"SECTION";NS$:INPUT"POINTS EARNED TO DATE";PE:INPUT"POIN
TS POSSIBLE TO DATE";PO
3090 CLS:PRINTCHR$(23):PRINT"WAIT, PLEASE":FOR I=SU TO C-1 STEP-
1:PRINT@10,CHR$(166):LN$(I+1)=LN$(I),F$(I+1)=F$(I),MF$(I+1)=MF$(
I),SC$(I+1)=SC$(I),PTS(I+1)=PTS(I),PP(I+1)=PP(I):PRINT@10,CHR$(1
53):NEXT I

```

Program Listing 2. File Update.

```

3095 SU=SU+1:LN$(C+1)=NL$(C+1)=N$:MF$(C+1)=SX$:SC$(C+1)=NS$:P
TS(C+1)=PE:PP(C+1)=PO:CLS:RETURN
4000 END:"DELETES A NAME
4010 CLS:PRINTCHR$(23):F=0:PRINT@512,"WARNING, THIS ROUTINE IS
POWERFUL!":GOSUB1010:PRINT"ONCE A NAME IS DELETED, IT IS
LOST.":PRINT"DO YOU WANT TO DELETE A NAME (Y/N)?"
4015 A$=INKEY$:IF A$=""THEN 4015
4020 IF A$="Y" THEN RETURN
4030 CLS:INPUT"LAST NAME OF STUDENT TO BE DELETED";NL$:INPUT"FI
RST NAME";N$:INPUT"SECTION";NS$
4040 CLS:PRINT"THANK YOU - PLEASE WAIT."
4050 FOR S=1TOSU
4060 IF (LN$(S)=NL$)AND(F$(S)=N$)AND(SC$(S)=NS$) THEN F=1:C=S:
GOTO4060
4070 NEXT S
4080 IF F=0 THEN PRINT"STUDENT NOT FOUND IN FILE -- CHECK SPELL
INGS!":RETURN
4090 FOR S=CTOSU
4100 LN$(S)=LN$(S+1):F$(S)=F$(S+1):MF$(S)=MF$(S+1):SC$(S)=SC$(
S+1):PTS(S)=PTS(S+1):PP(S)=PP(S+1)
4110 NEXT S:SU=SU-1
4120 RETURN
5000 END:"CORRECTS ERRORS IN FILE
5010 CLS:F=0:PRINT"ENTER ALL INFORMATION REQUESTED FOR RECORD TO
BE CHANGED":PRINT"REMEMBER - ENTER IT AS IT PRESENTLY APPEARS."
5020 INPUT"OLD LAST NAME";EN$:INPUT"FIRST NAME";EF$:INPUT"
SECTION";ES$
5030 CLS:PRINT"SEARCHING - PLEASE WAIT"
5040 FOR S=1TOSU
5050 IF (LN$(S)=EN$)AND(F$(S)=EF$)AND(SC$(S)=ES$) THEN F=1:C=S:
GOTO5050
5060 NEXT S
5070 IF F=0 THEN PRINT"NOTHING FOUND IN FILE MATCHING REQUEST":R
ETURN
5080 CLS:PRINT"WHAT FIELD IS TO BE CHANGED?"
5100 PRINT"LAST NAME - ENTER L"
5110 PRINT"FIRST NAME - ENTER F"
5120 PRINT"SECTION - ENTER S"
5130 PRINT"SEX (I) - ENTER X"
5140 PRINT"PTS EARNED - ENTER P"
5150 PRINT"PTS POSSIBLE-ENTER O"
5160 PRINT:PRINT"YOUR CHOICE?"
5170 A$=INKEY$:IF A$=""THEN5170ELSECLS
5180 IF A$="L" THEN INPUT"CORRECT LAST NAME";LN$(C):GOTO6000
5190 IF A$="F" THEN INPUT"CORRECT FIRST NAME";F$(C):GOTO6000
5200 IF A$="S" THEN INPUT"CORRECT SECTION";SC$(C):GOTO6000
5210 IF A$="X" THEN INPUT"CORRECT SEX";MF$(C):GOTO6000
5220 IF A$="P" THEN INPUT"CORRECT POINTS EARNED";PTS(C):GOTO6000
5230 IF A$="O" THEN INPUT"CORRECT POINTS POSSIBLE";PP(C):GOTO6000
6000 PRINT"ARE THERE MORE CHANGES TO BE MADE TO THIS RECORD (Y/N
)?"
6010 A$=INKEY$:IF A$=""THEN 6010
6020 IF A$="Y"THEN 5090
6030 RETURN
6040 END

```

played on the screen with a message requesting the number of grades for this section. Going back to our example, the response would be three (don't forget the absence). Once the response is given, the next question appears at the bottom, asking the maximum possible points for each grade. In our example, we would respond with 20,5,15—the quiz John missed was worth 15 points. After the third maximum is entered, the first student's name is displayed at the top of the page. For John we would enter 15,4 and -1 (I'll explain this later). At the right side of the screen,

John's percent grade will appear. If you don't have a printer, you'll need to copy this grade or use the data base display program to record your grades. If your school uses letter grades, you'll need to convert them or add a few lines of code to display the letter grade.

As soon as John's grade is displayed, the next student's name is shown on the following line and the process continues. When the next section is encountered (remember the program detects this by the section number) you are given an opportunity to change the maximum number of points for each score

and the number of scores.

Now, that -1 mentioned earlier is one of four codes available during the operation of the program. They are listed at the bottom of the grading page. They are: -1: The student was absent and the grade is to be ignored; -2: Correct the spelling of the individual's last name; -3: Correct the line because of a grade input error; -4: Correct the previous line because of an error.

After all grades have been entered for all sections, the screen is cleared and you are instructed to place your data tape in the cassette recorder; play, record, and enter. The new data will be recorded and the program will end. The percent grade displayed is not recorded on tape, but the number of points earned and the number of points possible for that student are

recorded. This is one of the most important features of the program because it allows you to update your grade book at any time without worrying about throwing the grades out of balance. The next time the grading program is run, the previous grades are read and the new grades accumulated.

Display Data Base

This program was designed for schools that do not have a printer. It will display the contents of the data file. No changes can be made by this program. Execution can be halted by a shifted @ and resumed by depressing any key.

Printed Output

So far none of the programs provide printed output. If you have a printer, read on! The three following programs are for

```

10 REM *STUDENT GRADES FROM DATA BASE*
20 CLS:PRINT@86,"**STUDENT GRADES**";PRINT:PRINT STRING$(63,"")
:PRINTTAB(26)"WRITTEN FOR";PRINTTAB(21)"NORTHERN MIDDLE SCHOOL":
:PRINTTAB(31)"BY";PRINTTAB(25)"ROGER J HEDDEN";PRINT@982,"**ALL RI
GHTS RESERVED";GOSUB1010:CLS
70 PRINT"PUT YOUR DATA TAPE IN THE CASSETTE PLAYER AND PRESS 'P
LAY'";FOR X=1TO10:PRINT:NEXT:INPUT"THEN PRESS 'ENTER'";A$:CLS
80 PRINT CHR$(23):PRINT"YOUR TAPE IS NOW LOADING. WHEN IT
HAS FINISHED LOADING, TURN YOUR CASSETTE TO THE OPPOSITE SI
DE AND REWIND IT TO THE BEGINNING.";FOR ZZ=1TO1000:NEXTZZ:CLS:P
RINT"YOUR DATA IS AS FOLLOWS:"
90 CLEAR 4000
100 DIM LNS$(150),F$(150),MF$(150),SC$(150),PTS(150),PP(150),T(25
),I(25)
110 Q=129
120 GOSUB 3010:"**READS INPUT FILE**":CLS
130 SC$(0)=SC$(1):CLS:GOSUB 3030:GOSUB 3070
140 FOR S=1TO(SU-1)
150 IF LEFT$(SC$(S),2)<LEFT$(SC$(S-1),2) THEN PRINT@Q,END OF
SECTION";:INPUT"/PRESS ENTER FOR NEXT SECTION";AS:GOSUB 3030:
GOSUB 3070
160 PRINT@Q,STRING$(63,"");:PRINT@Q,LNS$(S);";";LEFT$(F$(S),1)
170 T=17
180 FOR I=1TON
190 PRINT@Q,T,"";:INPUT ST(I)
200 PRINT@Q,T),ST(I):T=T+3
210 IF ST(I)>=0 THEN PTS(S)=PTS(S)+ST(I):PP(S)=PP(S)+T(I):NEXTI:
ELSE IF ST(I)=-1 THEN NEXTI:ELSE IF ST(I)=-2 THEN GOSUB 3210:PTS(
S)=0:PP(S)=0:NEXT S ELSE IF ST(I)=-3 THEN S=S-1:PTS(S)=0:PP(S)=0
:NEXTS ELSE IF ST(I)=-4 THEN S=S-2:PTS(S)=0:PP(S)=0:NEXT S
215 ON ERROR GOTO 240
220 F=INT((PTS(S)*100)/PP(S))
230 PRINT@Q,Q+58),F;:Q=Q+64:IF Q>832 THEN Q=129
240 NEXT S
250 PRINT@Q,STRING$(63,"");:PRINT@Q,"LAST STUDENT OF LAST SECTIO
N--PRESS 'ENTER' TO PROCEED";:INPUT A$
260 CLS:PRINT CHR$(23)
270 INPUT"MAKE SURE YOUR TAPE IS WOUND PAST IT'S LEADER. PRES
S 'PLAY' AND 'RECORD'. WHEN YOU'RE READY PRESS 'ENTER'";:INPUT
A$:PRINT
280 PRINT"THE NEWEST DATA IS BEING RECORD-ED ON TAPE--THIS WILL
TAKE A FEW MINUTES."
290 GOSUB 3150
295 PRINT#-1,"END","OF","FILE","SECTION",1,1
300 CLS:PRINT CHR$(23):PRINT"ALL DONE --- BYE."
310 END
1000 END:'TIMER DELAY
1010 FOR ZZ=1TO1000:NEXT:RETURN
3000 END:'READS INPUT FILE FROM LINE 120
3010 FOR S=1 TO 150:INPUT#-1,LNS$(S),F$(S),MF$(S),SC$(S),PTS(S),P
P(S):SU=S:IF LNS$(S)="END" THEN RETURN
3015 PRINT LNS$(S);";";F$(S);";";SC$(S);";";IF PTS(S)>0 THEN P
RINT INT(PTS(S)/PP(S)*100);"% ELSE PRINT "NO GRADE"
3016 NEXT S:RETURN
3020 END:'PRINTS HEADERS*
3030 CLS:PRINT"NAME";TAB(20)"GRADES - -";TAB(62)"%"
3040 FOR X=0TO127:SET(X,3):SET(X,44):NEXT
3050 PRINT@960,"CODES:STUDENT ABSENT(-1)**CORRECTIONS-NAME(-2)-A
LL(-3)-LAST(-4)";:RETURN
3060 END:'SET NUMBER OF INPUT GRADES
3070 PRINT@641,"";:INPUT"HOW MANY GRADES ARE THERE FOR THIS SECT
ION";N
3080 PRINT@641,STRING$(60,"");:W=850
3090 PRINT@833,"MAX. POINTS";:FOR I=1 TO N:PRINT@W,"";:INPUT T(I
):PRINT@W,T(I);:W=W+3:NEXT I
3100 RETURN
3110 END:'CORRECT NAME OR GRADE
3120 PRINT@Q,STRING$(63,"");:PRINT@Q,"";:INPUT"CORRECT LAST NAME
";LNS$(S):PRINT@Q,LNS$(S);";";LEFT$(F$(S),1)
3130 RETURN
3140 END:'OUTPUTS DATA TO TAPE.
3150 FOR S=1TOSU
3160 PRINT#-1,LNS$(S),F$(S),MF$(S),SC$(S),PTS(S),PP(S)
3170 NEXT S
3180 RETURN
3200 END
3210 IF ST(I)=-2 THEN GOSUB 3120:S=S-1:RETURN
3215 END

```

Program Listing 3. Grading Program.

```

10 REM *LIST SECTION ROSTERS*
20 CLEAR500:CLS:PRINT@87,"**PRINT ROSTERS**";PRINT:PRINT STRING$(
63,"");:PRINTTAB(26)"WRITTEN FOR";PRINTTAB(21)"NORTHERN MIDDLE
SCHOOL":PRINTTAB(31)"BY";PRINTTAB(25)"ROGER J HEDDEN";PRINT@982,
"**ALL RIGHTS RESERVED";
30 L=63:GOSUB 1010:CLS
40 INPUT"YOUR NAME PLEASE";T$
60 INPUT"WHAT SUBJECT";S$
70 CLS:PRINT"THANK YOU";GOSUB1010:PRINT@512,"LOAD YOUR DATA TAPE
- THEN PRESS ENTER";:INPUT A$
80 L$="AAA"
90 INPUT#-1,LNS,F$,MF$,SC$,PTS,PP
100 IF LEFT$(SC$,2)<LEFT$(L$,2) THEN GOSUB 2005
110 LPRINTTAB(5)LNS;TAB(20)F$;TAB(35)SC$;IF PP<0 THEN LPRINTT
AB(50) INT(PTS*100/PP)ELSE LPRINTTAB(50)"NO GRADE"
120 L=L+1:GOTO 90
1000 END:'TIMER DELAY
1010 FOR ZZ=1TO1000:NEXT:RETURN
2000 END
2005 IF LNS="END" THEN GOSUB 3010:END
2010 FOR Z=LTO66:LPRINT "NEXT Z
2020 LPRINTTAB(16)"N O R T H E R N M I D D L E S C H O O L
":LPRINT "
2030 LPRINTTAB(5) S$; - ";T$;TAB(60)"CLUSTER";MID$(SC$,2,1)
2040 LPRINTTAB(5) STRING$(24,""); SECTION ROSTER ";STRING$(24,
"");:LPRINT "
2050 L=6:L$=SC$:RETURN
3000 END
3010 CLS:PRINT"END OF FILE";PRINT:GOSUB1010:PRINT"TO ADVANCE PAP
ER, PRESS 'A'";:PRINT"TO END PROGRAM, PRESS 'E'."
3020 A$=INKEY$
3025 IFA$=" " THEN 3020
3030 IF A$="A" THEN LPRINT "GOTO 3020
3040 IF A$<"E" THEN GOTO 3020
3050 END

```

Program Listing 4. Section Roster Printer.

```

10 REM *CRT DISPLAY OF DATA BASE*
20 CLS:PRINT@85,"**DISPLAY DATA BASE**";PRINT:PRINTSTRING$(63,""
");:PRINTTAB(26)"WRITTEN FOR";PRINTTAB(21)"NORTHERN MIDDLE SCHOOL
";:PRINTTAB(31)"BY";PRINTTAB(25)"ROGER J HEDDEN";PRINT@982,"**ALL
RIGHTS RESERVED";:GOSUB1010:CLS:PRINTCHR$(23)
30 CLEAR 4000:DIM LNS$(150),F$(150),MF$(150),SC$(150),PTS(150),PP
(150)
31 INPUT"PREPARE TAPE - THEN HIT ENTER";QS
50 FOR I=1 TO 150
60 INPUT#-1,LNS(I),F$(I),MF$(I),SC$(I),PTS(I),PP(I)
65 IF LNS(I)="END" THEN GOTO 100
66 PRINT:PRINT"NUMBER ";I; OF LIST."
70 PRINT LNS(I);";";F$(I);";";MF$(I);";";SC$(I)
75 IF PP(I)>0 THEN PRINT"GRADE ";INT(PTS(I)*100/PP(I));"%
80 PRINT
90 NEXT I
100 PRINT "JOB COMPLETE"
110 END
1000 END:'TIMER DELAY
1010 FOR ZZ=1TO1000:NEXT:RETURN

```

Program Listing 5. Data Base Display.



PROVEN MONEY MAKERS FOR YOUR TRS-80*

*Tandy Corp. Trademark

MAIL LIST SYSTEM (disk only) \$69.95

Our easy-to-use system will accommodate almost any "custom" requirement of even your most demanding clients. A glance below will show that we are far ahead of any other system in speed, variety of features, and sheer volume of names handled...but don't let that fool you. This system can be used just as easily on one disk for a small Christmas card list.

- Maintain virtually an infinite number of disks all in continuous alph. or zip order...essential for large lists.
 - Sort 2320 entries (2 full 40 track double density disks) in only 32K or an incredible 4640 entries (2 full 80 track double density disks) in only 48K!...Made possible with our unique date compression techniques on the Model III.
 - Super fast sort by alph. or zip order (8 sec. for 1000 entries)...both orders can exist simultaneously on disk.
 - High speed recovery of entries from disk...speed of sort is meaningless if retrieval from disk is slow...ours pulls in over 11 per sec!
- NEW**
- Transfers old files over to our system.
 - In zip order all entries with same zip code are also arranged alphabetically.
 - Four digit zips have a leading "0" appended on labels.
 - Backup data disks are easily updated as entries are created, edited, or sorted...extremely useful!
 - Optional reversal of name about comma for that non-computer, personalized look.
 - Master printouts of your list in several formats (not just a rehash of the labels). Optionally continuous or pages oriented...Your customers will want this!
 - All 0's in address labels are replaced by easier to read O's.
 - All labels optionally support an "Attn:" line.
 - Many user defined fields with plenty of options for simultaneous purging and selecting...even allows for inequalities...powerful and easy to use!!
 - Continuous display of how many addresses printed.
 - Each disk entry automatically "remembers" how many mailings have been made for that particular entry...Can be tied in with purge/select.
 - Primarily written in BASIC for easy modification...embedded machine code for those speed sensitive areas.
 - Editing is simple and fast...automatic search.
 - Optional 9 digit zip.
 - Deleted entries have "holes" on disk filled automatically...and alph. order is still maintained!
 - Test label printing lets you make horizontal and vertical adjustments with ease.
 - Optional "one time" mailing for some selected entries.
 - Extensive use of error traps (both operator and machine induced)...even recovers from a power failure during a printout!...recycling on disk errors.
 - Patch program allows you to upgrade the system to any DOS.
 - Documentation manual available separately for \$3.95.
 - Hardware requirements: 32K printer, and 1 or 2 disk drives.

Football Scouting Report (Disk Only) \$89.95

How many high schools and colleges are there within a 75 mile radius of you? Did you know that each is a potential customer at the rate of from \$500-\$1000 per season? Many already subscribe to more expensive (but inferior) computer analysis services of their scouting reports. Using such a service a coach will typically have an opponent scouted several times prior to actually playing them...This series of programs was written to the specifications of a coach with two state championships to his credit. As a result, the emphasis is on producing statistics that will help in predicting what the opponent will do in a given situation...This is a sophisticated set of programs fully equivalent to that used by professional football teams.

- Separate and detailed analysis of running, passing, and kicking.
- Passing and running tendencies by field position.
- Point of attack tendencies and statistics for runs.
- Tendencies and statistics for wide/short side, weak/strong side, and left/right run.
- Each analysis can be broken down according to formation, down, and yards to go.
- Allows for up to 5 games to be analyzed simultaneously.
- Convenient disk storage of plays and games.
- Extensive error traps...won't let you make an error.
- Two actual games (almost 100 plays) on disk to facilitate your learning and evaluation.
- Documentation available separately for \$3.95...even includes some advertising and price samples to help plan your promotion. Also included are some sample printouts.
- Hardware requirements...32K, 1 disk driver and printer.

Interfaces to your own basic programs...sort with the speed of machine code but with the convenience of basic. You don't have to

FAST SORT (handles multiple dim. arrays) and ALPHABETIZER (disk only) \$19.95

know assembly language programming to use these programs. Just use your disk to merge our short basic programs (with embedded machine code) with your own basic program. Follow our simple instructions to poke several values before making the user call from basic. The pokes will set up a sort for string, integer, single, or double precision arrays. Also ascending or descending order is controlled by a single poke. Use one of two programs to sort arrays of the form A(1) or A(Q(1))...The disk includes 8 simple basic programs that are ready to merge with the main sort programs. Use them for learning and evaluation...Also included is a ready to use basic program (already merged with the ORDER program). Use it to obtain a printout of alphabetized names. This program alone is worth \$19.95.

Sample Sort Times

8 sec. for 1000 dbl. prec. numbers...50 sec. for 5000 integers. (Ours is one of the only alphabetizers that both ignores non alph. characters and treats upper and lower case alike.)

Provide your customers with a **CALENDAR \$19.95** printed calendar (along with standard banker's holidays) of any month of any year...Useful in motivating history students. Holds the same fascination for students as a game. Tape only for Model I or III.

Same features as Calendar. **SUPER CALENDAR** Additionally prints out large "graphics" type wall calendars (tape only) **\$29.95** with memos under each day. Use as a planning calendar with optional disk storage...requires 16K and printer.

LOAN AMORTIZATION \$19.95 (Tape only for Model I & III)

Loan amortization schedules are a must for banks, S & L institutions, and accounting firms. You will be able to charge \$5 plus per schedule. Multiply that times the number of all loans your clients make per day...easiest money we know of!...runs in about 2 minutes and achieves pin point accuracy with a built in calendar...This sophisticated program produces an exceptionally professional looking printout.

Precision Prototypes

410 E. Roca
Refugio, Tx. 78377
(712) 276-4758

- Specify Model I or III when ordering
- Add \$1.50 postage and handling

Visa
Mastercharge
C.O.D.

use with a printer only. If you attempt to use them with no printer attached or the printer off, the computer will freeze when it attempts to execute a print.

Grade Book Printer

Remember that when you typed the names of your students into the data base builder, I said it was the last time you'd have to do it? Here's proof: The program is designed for 9.5 inch by 11 inch pin feed paper. After the print operation is completed, I tear off the perforations, punch three holes in it and put it in a looseleaf notebook. If the page gets full, I generate another. The program prints 10 characters per inch and six lines per inch vertically. It will print one section per page and automatically advance to the next page for the next section. I use Okidata's Microline 80. If you use this program, you should change line 1015 to reflect the name of your school.

There are two operator entries required at the beginning of the program, the teacher's name and subject. Once these have been entered and the tape is in place, the program takes it from there.

The Section Roster Printer program is similar to the grade book printer except that it prints the grade status of each student instead of a series of boxes.

The Failure Notice Printer

One of the objections often heard from parents is that the school doesn't communicate with them regarding their child's grade. Teachers have a tremendous amount of paperwork to do, and it is easy to ignore a failing grade. This program reads the data tape and generates a note to the parent of each child who is not passing the course. After all notices have been printed, the program prints a report for the teacher so he can keep track of the signed notes

as they come back. I use roll paper to print these notes with a cut line for separating them. They are designed so they can be folded and stapled with the name and section showing.

If you want to ease into it, try the data base builder and grading program first. Once you've done this much, you'll either be

hooked or hate it. If my experience is any indication, you'll spark a lot of other people's interest when you sit with your feet propped up reading your favorite professional journal while your colleagues sweat over their grade reports. What used to take me two hours now takes me 20 minutes! ■

```

10 REM *PRINTS A GRADE BOOK PAGE FOR EACH SECTION*
20 CLEAR 500:CLS:PRINT@85,**GRADE BOOK PRINTER**,:PRINT:PRINTST-
RINGS(63,**):PRINTTAB(26)"WRITTEN FOR":PRINTTAB(21)"NORTHERN MI-
DDLE SCHOOL":PRINTTAB(31)"BY":PRINTTAB(25)"ROGER J HEDDEN":PRINT
@982,**ALL RIGHTS RESERVED**,:GOSUB5010:CLS
25 L=66:LS$="AAA":INPUT"TEACHER'S NAME ";TS:INPUT"SUBJECT ";SS:C
LS:INPUT"INSERT DATA TAPE AND PRESS 'PLAY'";GS:CLS:PRINT"WORKING
"
30 GOSUB 2010:'READ RECORD' FROM INPUT FILE
40 IF LEFT$(SC$,2)<>LEFT$(LS$,2) THEN GOSUB1010
50 IF LN$<>"END" THEN GOSUB3010:GOTO30
60 PRINT"JOB COMPLETE":END
1000 END
1010 IF L<>66 THEN GOSUB4010:IF LN$="END" THEN RETURN
1015 LPRINTTAB(16)"N O R T H E R N   M I D D L E   S C H O O L
":LPRINT" "
1020 LPRINTTAB(5) SS;" - ";TS;TAB(60)"CLUSTER ";MID$(SC$,2,1):LP
RINTTAB(5) STRINGS(70,**):LPRINT" ":L=6:LS$=CS$
1030 RETURN
2000 END
2010 INPUT#-1, LN$, F$, MF$, SC$, PTS, PP
2020 RETURN
3000 END
3010 LPRINTTAB(4) LN$;" ";LEFT$(F$,1);TAB(20) SC$;TAB(24) " ";
3020 FOR X=1 TO 17
3030 LPRINT"...";
3040 NEXT X
3045 LPRINT" "
3050 L=L+1:LS$=SC$
3060 RETURN
4000 END
4010 FORS=L TO 66:LPRINT" ":NEXT S
4020 RETURN
5000 END:TIMER DELAY
5010 FORZZ=1 TO 1000:NEXT:RETURN

```


Program Listing 6. Grade Book Printer.

```

10 REM *PRINT FAILURE NOTICE REPORTS AND REPORT*
20 CLS:CLEAR 4000:E=0:I=1:PRINT@86,**FAILURE NOTICES**,:PRINT:P
RINTSTRINGS(63,**):PRINTTAB(26)"WRITTEN FOR":PRINTTAB(21)"NORTH
ERN MIDDLE SCHOOL":PRINTTAB(31)"BY":PRINTTAB(25)"ROGER J HEDDEN
":PRINT@982,**ALL RIGHTS RESERVED**,:GOSUB1010:CLS:INPUT"TE
ACHER'S NAME ";TS:INPUT"TEACHER'S SUBJECT";SS:INPUT"REPORT DATE";
DS:CLS:INPUT"LOAD DATA TAPE, PRESS 'PLAY', THEN 'ENTER'";GS$
30 INPUT#-1, LN$, F$, MF$, SC$, PTS, PP
40 IF LN$="END" THEN GOSUB 2010:END
50 IF INT(PTS*100/PP)<60 THEN GOSUB 3010
60 GOTO 30
70 ***** END OF MAIN PROGRAM *****
1000 END:TIMER DELAY
1010 FOR Z=1 TO 1000:NEXT:RETURN
2000 END:PRINTS MASTER REPORT
2010 LPRINTSTRINGS(80,"-"):FOR L=1 TO 3:LPRINT" ":NEXT
2020 LPRINTTAB(16)"N O R T H E R N   M I D D L E   S C H O O L
":LPRINT" "
2030 LPRINTTAB(5) SS;" - ";TS;TAB(60) DS$
2040 LPRINTTAB(5) STRINGS(24,**);" FAILURE REPORT ";STRINGS(24,"
**):LPRINT" "
2050 FOR S=1 TO E
2060 LPRINTTAB(5) L1$(S);TAB(20) F1$(S);TAB(35) S1$(S);TAB(45)
G1$(S);TAB(55)"RETURNED-( )"
2070 NEXT S
2080 RETURN
3000 END:PRINTS A FAILURE NOTICE FOR EACH FAILING STUDENT
3010 IF MF$="M" THEN PN$="HIM":PO$="HIS" ELSE PN$="HER":PO$="HER"
"
3030 LPRINTSTRINGS(80,"-"):LPRINT" "
3040 LPRINTTAB(5) LN$;" ";F$;TAB(65)"SECTION ";SC$:LPRINT" ":LPR
INT" "
3050 LPRINTTAB(10)"I THOUGHT THAT YOU SHOULD KNOW THAT ";F$;"S
";SS;" GRADE IS"
3060 LPRINT"PRESENTLY ";INT(PTS*100/PP);"% . PLEASE TAKE A FEW
MINUTES TO DISCUSS THIS WITH ";PN$;" "
3070 LPRINT"IF YOU HAVE ANY QUESTIONS ABOUT ";PO$;" WORK, PLEASE
GIVE ME A CALL.":LPRINT" "
3080 LPRINTTAB(10)"PLEASE SIGN AND RETURN THIS WITH ";F$;" . THA
NK YOU.":LPRINT" "
3090 LPRINTTAB(40)"SINCERELY,":LPRINT" "
3100 LPRINTTAB(40) TS;" - ";SS:LPRINT" "
3110 LPRINTTAB(5) STRINGS(20,CHR$(95));TAB(60) DS$
3120 LPRINTTAB(5)"Signature"
3130 FOR L=1 TO 15:LPRINT" ":NEXT
3140 L1$(I)=LN$:F1$(I)=F$:S1$(I)=SC$:G1$(I)=INT(PTS*100/PP):I=I+1
:E=I
3150 RETURN

```

Program Listing 7. Failure Notice Printer.



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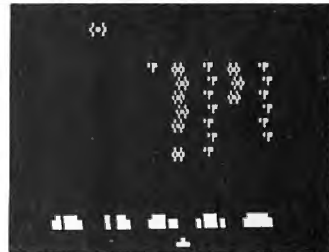
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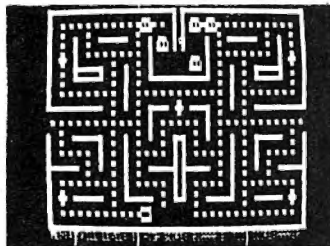
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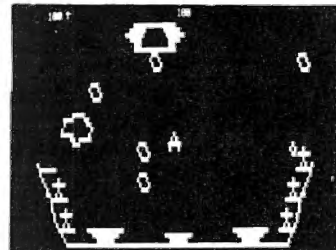


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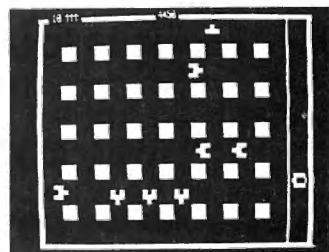
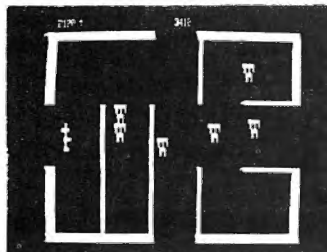
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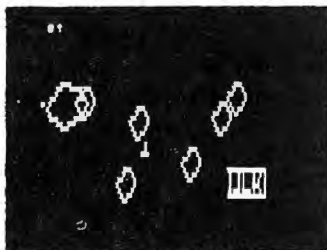
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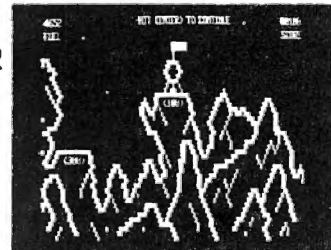


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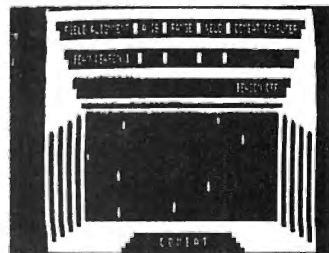
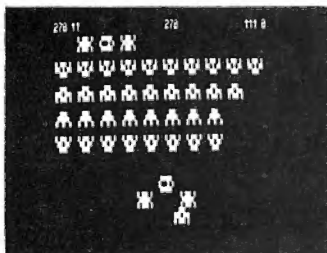
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THE COMPLEAT IDIOT'S BOOKKEEPER (TCIB) Product Overview

GENERAL DESCRIPTION

BACKGROUND

TCIB was written by Larry Raper. Larry is a Chartered Life Underwriter and Licensed Life Insurance Counselor. He has consistently ranked among the top Sales Managers nationally in his company for the past several years. He also writes software for insurance and financial planning applications. TCIB came about as a result of a humiliating visit Larry made to his accountant - carrying a briefcase full of unorganized checks, receipts and other financial information. As a result of that visit, he decided there had to be a better way. TCIB is the result of that experience.

It is intended that this set of programs should be easily usable by any person who has to keep his/her own financial records. The next section will provide an overview of the specific capabilities of this package.

PRODUCT CAPABILITIES

What will TCIB do?

Data Gathering - TCIB provides a simple method of entering your financial information into a disk file. A format screen is presented which will prompt you for entry of the required data from your records. The following fields are provided:

FIELD NAME	NUMBER OF CHARACTERS
Identifier	8
Date	4
Payor/Payee	18
Description	18
Category/Account	5
Income or Expense	1
Deductible or Non-deductible	1
Amount	9

A screen-oriented editor allows you to see the whole record as you are entering it. You are free to move about in the record and change any data you wish. Once you are satisfied with the results, pressing the <ENTER> key causes the program to (1) review the data you entered for possible errors - and (2) assuming no errors, write the record to the disk file.

Since most people are not able or willing to post every financial transaction immediately as it occurs, provision has been made for the fact that "catching up" will almost always result in duplicate entries. (e.g. you may enter the same check twice, or enter a check and receipt covering the same transaction). A "PURGE" program guides the computer to search your file or files for possible duplicate entries and, if found, present them to you for disposition.

Data Manipulation - In addition to the "PURGE" capability just described (technically a data manipulation feature), TCIB also features other important data manipulation abilities:

"EDIT" - allows you to retrieve, edit or delete any record in any TCIB file. You can retrieve a record by its record number. You can search any field of all or part of a file for any record containing your search target as all or part of the target field. You can also do a multiple file, single or multiple field search of from 1 to 20 separate files in a single search after building the appropriate index. Any time a search results in retrieving a record, the record will be displayed and you will have the choice of carrying out any desired editing functions. When you are finished with the record currently being displayed, you will have the choice of continuing with the search, returning to normal edit functions, editing another file or returning to the main menu.

"INDEX" - This program allows the user to build a single index to the contents of from 1 to 20 selected files. The index can span one or more fields in a single record. This information is sorted and stored on the disk. The REPORT GENERATOR and EDIT programs use the index to control their access to the chosen files.

The index is limited to a maximum of 10 character from each of 1000 records. If more than 10 characters per record are used in building the index, the number of records to which it can point will be reduced proportionately. Since the programs are referred to in unprotected source code, you are free to "play with" the string space and index arrays if your DOS leaves you more headroom.

"REFILE" - The purpose of this utility program is to allow you to build a new file by copying any records in an old file which satisfy your search requirements to the new file. You can also copy selected records from one file to another in the same way. This search can be done with a MATCH or NON-MATCH test. For example, when you instruct the EDIT program to DELETE a record, it replaces the contents of the Identifier field with "DELETED". You can then use the REFILE utility to copy all records which DO NOT have DELETED as their identifier to a new file.

"SEPARATE" - This program reads a specified data file and checks each date. Each month's transactions are copied into a separate file. If there are no transactions for a given month, no file is created. The files created are named JAN/DAT, FEB/DAT, etc. This utility can be run several times during an accounting period. If a required monthly data file already exists, the new data will be added to it. Otherwise it will be created and the new data entered into it.

REPORT GENERATOR - This program represents the final step in transforming unorganized financial data into useful financial reports.

After you have INSERTed your financial data, EDITed it to your satisfaction, PURGEd, REFILEd, and SEPARATEd as you want, you are now ready to INDEX it and REPORT. The report generator program first reads the index you have built, and based on that presents you with a finished product. Each major category (the first item of your index) will be presented on a separate page. Income entries will be shown as a simple, formatted numeric value. Expense entries will be shown in parentheses. Each page will contain a running sub-total of the current major category (Income items will be added, expense items will be subtracted). The sub-total will also be presented in the above format. Finally, a summary page will be printed, itemizing each major category covered in the report (such as IRS form 1040 Line #) along with that category's sub-total. Finally an overall total of all entries covered by the index will be presented to finish your report.

MAKE-VC - An additional utility program is available at extra cost to allow the transfer of files from TCIB to VISICALC. This makes use of VISICALC's "DIF" format and is very useful for performing special computations with data gathered by TCIB. Incidentally, if you wish, TCIB files can also be created by VISICALC if you conform to the requirements specified in the "MAKE-VC" program.

Product Limitations - Before we create the impression that this program is the "end all and be all" let us hasten to talk about its requirements and limitations. This list of limitations is probably not all-inclusive. Doubtless, someone will find some way in which to push the program past its limits that we never thought of - however, this is a good start. PLEASE READ THIS SECTION CAREFULLY TO AVOID DISAPPOINTMENT!

1) With the exception of the screen input routine and the sort routine, the programs are written entirely in BASIC. The programs are furnished to you in UNPROTECTED source code. While this gives you the opportunity to study program and/or modify it to your special needs (AT YOUR OWN RISK, OF COURSE), interpreted BASIC just isn't as fast as machine language.

2) This program does a LOT of string manipulation. As a result, at times the computer will occasionally have to stop and "collect its wits" (i.e. do "garbage collection" on its string space).

The answer to this peculiarity is "DON'T PANIC" - we have never seen a "garbage collection" shutdown more than a few moments. Just watch for the cursor. If it is flashing, all is well and you can proceed with data entry. If it is not flashing, relax a moment and proceed when it resumes flashing. You can type as fast as you want in data input. We have yet to see anyone able to type faster than the program can accept the data.

3) There are only two restrictions on the amount of data you can handle with TCIB.

Disk Storage - all data being used by the programs MUST be on disk(s) mounted on drive(s) currently in use. Swapping of data disks during program operation is NOT supported. You can, however, use as many drives as your hardware and operating system will support. You should be able to use any type of disk your hardware and operating system will support. (We have not tested the program with anything besides 5 1/4" drives, but if problems arise, let us know and we will do our best to help you overcome them.)

Computer Memory - TCIB requires 48K of RAM (and uses every bit of it, I might add). The INDEXER program leaves 15000 bytes free in which to build an index. Therefore, this is your main program limitation. The index itself uses 5 bytes per record for its own overhead. An index built on the category field (5 bytes) plus the date field (4 bytes) would use 14 bytes per record (5+4+5). As full 1000 records can be handled with a single index built on these fields. On the other hand, an index built on category (5 bytes) + date (4 bytes) + description (18 bytes) would use 32 bytes per record (5+4+18+5) and could only handle about 460 records. The "bottom line" is - don't put more information in your index than you REALLY need if you want to maximize the number of records you can handle. Also - keep an eye on available disk space when you are building an index. Be sure there is enough room or you'll wind up doing it over. If the program encounters a "disk full" error while writing the index, it will close the index file, kill it and tell you to provide enough disk storage before trying again.

Mod I or III, 48K, 1 drive **\$49.95**

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An old fashioned project for sentimental Model 15 owners.

Baudot LPRINT

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It only took a few hours on my new TRS-80 for me to realize that some type of hard copy was essential for any serious programming. Not being willing to invest the amount of money necessary to purchase a good printer, and preferring not to buy an inferior one, I took a hard look at using my model 15 teletype, at least as a temporary measure.

Now, unless you either own a baudot machine or can get one for a short song, the concessions which go along with using one make it impractical. The major disadvantage is not the lack of speed, but the inability to print many of the standard ASCII characters. The snail's pace printing is annoying, but if you plan your evenings well you can overcome that part. Just do your LLISTs and long LPRINTs as you watch television or while having your evening meal.

If you are still reading I assume you are either as stubborn as I am, have your own baudot printer, or are curious. Assuming you have a current loop driver which is TTL compatible, the hardware interface is very simple, requires no modification to

the TRS-80, no connection to the keyboard port, and does not interfere with any cassette operation. It does connect to the cassette port and therefore requires a method of connecting to the miniature phone plug that goes to the recorder. I installed a simple Y adapter in my recorder, plugged the lead from the keyboard into one side, and the wire going to the printer interface into the other side. This eliminates constantly plugging and unplugging the recorder, and running the risk of breaking the wires from fatigue. The two functions work well, though wired parallel.

Hardware

The circuit is shown in Fig. 1. A machine-language program takes input from the LPRINT function, converts the data to baudot, serializes it, and outputs it to the cassette plug.

This output is fed into one section of an LM3900 op amp to

bring the 0.8 volt pulses from the recorder port up to TTL level. The two sections of the 7414 Schmidt trigger inverters serve as buffers. The output of the 7414 goes to your TTL drivable current loop. Several articles have been published in *73* and *Kilobaud* for 60 and 20 mA current loops.

In this configuration a mark condition is represented by a high TTL level. This causes the loop to be active when the power is on the interface except when the TRS-80 sends a space signal. This prevents the machine from running "open".

Since this is a temporary measure for me, I stopped with the breadboard version of the interface. I have been using it for several months without any problems.

Software

The program is straightforward, although it may not appear so. Program Listing 1 is the

assembly listing (the program was hand assembled). The character to be LPRINTed is passed to the LPRINT routine in the C register by Basic. The normal LPRINT routine begins at location 058D H, which is pointed to by locations 4026H and 4027H of the printer device control block (DCB). This Basic program POKes the starting address of the new routine into these locations. That is, it puts location 7F00H into locations 4026H and 4027H. All subsequent LPRINT or LLIST commands will now go to our new location.

The character to be printed is limited to 7FH (to limit the table size). The program checks the incoming character for specials such as space, carriage return, %, <, =, etc. After this checking, a determination is made as to whether or not the carriage should be shifted. Once this decision is made, a flag is checked to see if the printer is in the necessary condition, and if not, sets it to the proper condition. Since there is no feedback from the printer it is necessary to disable the "unshift on space" feature. (On the model 15 this is a lever just above the keyboard.)

Now that our routine has properly determined the printer condition, it gets a substitute character from the table 7E00H to 7E7FH, for the ASCII character to be printed. This character is passed to the OUTCH subrou-

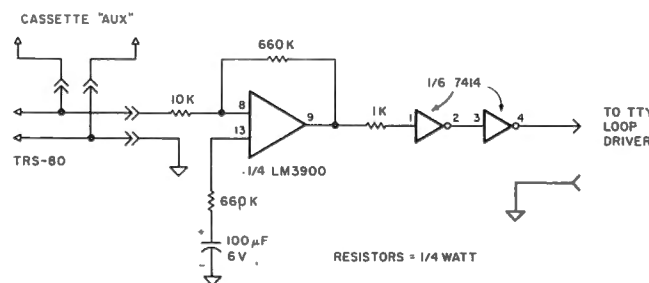


Fig. 1. Circuit Diagram.

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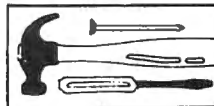
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tine in the A register. By using a timing loop the character is shifted out serially through port FF, the cassette port. All bits except bit 0 are forced to 0 during the LPRINTing. This keeps the cassette motor relay from trying to open and close at 45 baud!

If you look at the baudot substitution table, Fig. 2, you will see that the five-bit character has an eight-bit code. That is because the substitute character contains the data bits, the start bit and two stop bits. The stop bit requirement is actually about one and one half times the period for a data bit. But I found that my printer works perfectly with only one data-bit-length stop bit. So I ignore the second stop bit

by only shifting out seven bits (location 7FBBH). If your machine has problems you can change this to 08H and output eight bits. However, this will cost about 12 percent in speed.

The timing loop period is determined by the value stored in locations 7E84H, 7E85H. I found that there is a wide range of acceptable values, and this is the center of the range. If you have a faster baudot machine, this number will have to be reduced accordingly.

Location 7F31 contains the character number upon which an automatic carriage return and line feed will be issued. No characters are lost in this function. I made no provision for

page format, yet a counter could be incremented after each CR,LF and checked for page length.

Using the Program

All addresses given are for a 16K system, but this program works well in a 4K system as well. Fig. 3 lists the changes for a 4K system. Program Listing 1 is the Basic listing.

To use the program enter a number less than 32255 to the memory size prompt. For simplicity, I always enter 32000 because it causes problems if I forget and put a five where a two should be. Next CLOAD the program and run it. As the program executes, it prints the hex code

on the screen while it POKes into memory. As soon as you get the Ready prompt you can remove this Basic program from memory and use Basic as usual. Now the LLIST and LPRINT functions will operate your printer.

For safety, I always LPRINT a number and letter to get the printer in position after I first load the routine. The motor should be turned on after the loop is activated and turned off before the loop is deactivated. Programs which do not heed the memory size restrictions such as the Editor/Assembler will have to be modified (*Kilobaud*, Jan. 80) if you want to use this hard copy routine with them.

Character	Hex Code	Character	Hex Code
A -	C6	Q 1	EE
B ?	F2	R 4	D4
C :	DC	S Bell	CA
D \$	D2	T 5	E0
E 3	C2	U 7	CE
F !	DA	V ;	FC
G &	F4	W 2	E6
H #	E8	X /	FA
I 8	CC	Y 6	EA
J '	D6	Z "	E2
K (DE	LF LF	C4
L)	E4	CR CR	D0
M .	F8	SP SP	C8
N ,	D8	LTRS	FE
O 9	F0	FIGS	F6
P 0	EC	IDLE	FF

Fig. 2. Substitution Table.

```

LINE 10 M = 19968 : FIRST BYTE OF PROTECTED MEMORY
LINE 100 IF M = 20102 THEN GOTO 500
LINE 105 IF M > 20438 THEN END
LINE 500 M = 20224
LINES 1001 TO 1065 CHANGE ALL REMARKS OF 7EXX OR 7FXX TO 4EXX OR 4FXX RESPECTIVELY

```

```

1040 DATA 79,E8,7F,FE,0D,CA,AA,4F,FE,25,28,62,FE,20,28,67
1042 DATA FE,3C,28,8C,FE,3D,28,73,FE,3E,28,7A,FE,5B,CA,A1
1044 DATA 4F,FD,21,00,4E,CD,2B,4F,C3,3A,4F,F5,3A,80,4E,3C
1046 DATA FE,49,CC,AA,4F,32,80,4E,F1,C9,32,82,4E,FE,41,30
1048 DATA 11,FD,CB,81,46,28,1C,DD,2A,82,4E,DD,4E,00,CD,BA
1050 DATA 4F,C9,FD,CB,81,46,28,EF,FD,CB,81,86,3E,FE,CD,BA
1052 DATA 4F,18,E4,FD,CB,81,C8,3E,F8,CD,BA,7F,18,D9,3E,25
1054 DATA CD,25,4F,CD,47,4F,C9,3E,C8,CD,2B,4F,CD,BA,4F,C9
1056 DATA 3E,4C,CD,25,4F,3E,54,CD,25,4F,C9,3E,45,CD,25,4F
1058 DATA 3E,51,CD,25,4F,C9,3E,47,CD,25,4F,3E,54,CD,25,4F
1060 DATA C9,3E,1B,CD,25,4F,CD,47,4F,C9,3E,D0,CD,BA,4F,3E
1062 DATA C4,CD,BA,4F,3E,00,32,80,4E,C9,08,07,F5,E8,01,EE
1064 DATA 01,D3,FF,F1,CB,2F,CD,CC,4F,10,F1,C9,11,01,00,2A
1066 DATA 84,4E,ED,52,20,FC,C9

```

Fig. 3. Substitutions for 4K System.

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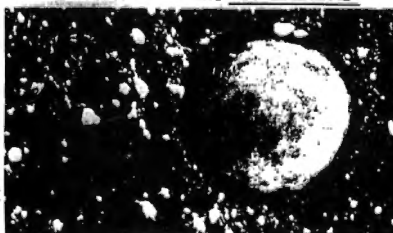
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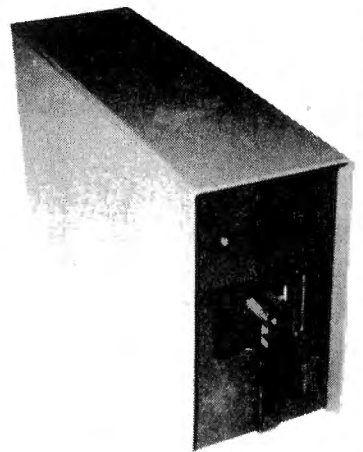
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There are a few subtle traps which you should be aware of. An example is the substitution for less than, which is LT. If you list a program and later reenter it from the listing and don't catch the substitutions, you will run into problems. The break key does not seem to work while the printer is going, but it will if you will just hold it down until the TRS-80 issues a CR,LF.

In summary I would like to list

what I think are the most important advantages and disadvantages of using a model 15 printer with your TRS-80.

Advantages

Baudot printers are easily obtained and cheap. This interface can be constructed for less than five dollars (excluding power supply). This routine is easily stored on cassette for easy

loading and editing, and the POKEd version is about a half kilobyte. Regular paper can be used, which is much easier to read than 20 or 40 column print.

Disadvantages

All ASCII characters cannot be printed, so substitutes must be made. The print is very slow and very noisy, and some specialized forms are difficult to use. The processor is tied up doing the trivial task of counting while in the timing loop, and interrupts should be disabled while using this routine.

Now that you have some of the facts you can decide if it's worth the effort to get that cheap hard copy. Once I got the routine all debugged I wondered why I waited so long to do it. A good fast printer is certainly in my future, but for now I can print summaries, reports and even gummed labels for a mailing list which look as nice as many of those from expensive printers. With a little care in reading, I can list all my programs when they get too large to fit on the screen. My conclusion is: The effort was certainly worthwhile. ■

```

7F00 79          LD A,C      GET CHARACTER
7F01 E6 7F     AND A,7FH  LIMIT TO 7F
7F03 FE 0D     CP A,0DH  CHK FOR CR
7F05 CA AA 7F  JP Z,OUTCRLF
7F08 FE 25     CP A,25H  CHK FOR ''
7F0A 28 62     JR Z,OUT''
7F0C FE 20     CP A,20H  CHK FOR SPACE
7F0E 28 67     JR Z,OUTSP
7F10 FE 3C     CP A,3CH  CHK FOR LT
7F12 28 5C     JR Z,OUTLT
7F14 FE 3D     CP A,3DH  CHK FOR EQ
7F16 28 73     JR Z,OUTEQ
7F18 FE 3E     CP A,3EH  CHK FOR GT
7F1A 28 7A     JR Z,OUTGT
7F1C FE 5B     CP A,5BH  CHK FOR !!
7F1E CA A1 7F  JP Z,OUT!!
7F21 FD 21 00 7E LD IY,7E00H INITIALIZE Y
7F25 CD 2B 7F  INITI CALL INIT
7F28 C3 3A 7F  INIT JP CONVERT
7F2B F5        PUSH AF
7F2C 3A 80 7E  LD A,COUNTR
7F2F 3C        INC A
7F30 FE 49     CP A,49H  CHK FOR 73RD CHCTR
7F32 CC AA 7F  CALL A,OUTCRLF
7F35 32 80 7E  LD COUNTR,A
7F38 F1        POP AF
7F39 C9        RET
7F3A 32 82 7E  CONVERT LD MBOX,A
7F3D FE 41     CP A,41H  CHK FOR SHFT OR UNSHFT
7F3F 30 11     JR NC,LTRSET
7F41 FD CB 81 46 FIGSET BIT 0,(IY&FLAG) SHFT TST
7F45 28 1C     JR Z,OUTFIG
7F47 DD 2A 82 7E CLOUT LD IX,MBOX GET OFFSET
7F4B DD 7E 00  LD A,(IX&STRT)GET SUB CHRTR
7F4E CD BA 7F  CALL OUTCH
7F51 C9        RET
7F52 FD CB 81 46 LTRSET BIT 0,(IY&FLAG) SHFT TST
7F56 28 EF     JR Z,CLOUT
7F58 FD CB 81 86 OUTLTR RES 0,(IY&FLAG) CLR
7F5C 3E FE     LD A,FEH  PRINT LTRS
7F5E CD BA 7F  CALL OUTCH
7F61 18 E4     JR CLOUT
7F63 FD CB 81 C6 OUTFIG SET 0,(IY&FLAG) SET FLG
7F67 3E F6     LD A,FEH  PRINT FIGS
7F69 CD BA 7F  CALL OUTCH
7F6C 18 D9     JR CLOUT
7F6E 3E 25     OUT'' LD A,25H  PRINT ''
7F70 CD 25 7F  CALL INITI
7F73 CD 47 7F  CALL CLOUT
7F76 C9        RET
7F77 3E C8     OUTSP LD A,C8H  PRINT SPACE
7F79 CD 2B 7F  CALL INIT
7F7C CD BA 7F  CALL OUTCH
7F7F C9        RET
7F80 3E 4C     OUTLT LD A,4CH  PRINT LT
7F82 CD 25 7F  CALL INITI
7F85 3E 54     LD A,54H
7F87 CD 25 7F  CALL INITI
7F8A C9        RET
7F8B 3E 45     OUTEQ LD A,45H  PRINT EQ
7F8D CD 25 7F  CALL INITI
7F90 3E 51     LD A,51H
7F92 CD 25 7F  CALL INITI
7F95 C9        RET
7F96 3E 47     OUTGT LD A,47H  PRINT GT
7F98 CD 25 7F  CALL INITI
7F9B 3E 54     LD A,54H
7F9D CD 25 7F  CALL INITI
7FA0 C9        RET
7FA1 3E 1B     OUT!! LD A,5BH  PRINT !!
7FA3 CD 25 7F  CALL INITI
7FA6 CD 47 7F  CALL CLOUT
7FA9 C9        RET
7FAB 3E D0     OUTCRLF LD A,D0H  PRINT CRLF
7FAC CD BA 7F  CALL OUTCH
7FAF 3E C4     LD A,C4H
7FB1 CD BA 7F  CALL OUTCH
7FB4 3E 00     LD A,00H  CLEAR CHRTR CNTR
7FB6 32 80 7E  LD COUNTR,A
7FB9 C9        RET
7FBA 06 07     OUTCH LD B,07H  SET FOR 1 STOP BIT
7FBC F5        HOLD PUSH AF  SAVE CHARACTER
7FBD E6 01     AND A,01H  PRESERVE OTHER BITS
7FBF EE 01     XOR A,01H
7FC1 D3 FF     OUT A,FFH  SEND DATA BIT TO PRTR
7FC3 F1        POP AF
7FC4 CB 2F     SRA A  SHIFT IN NEXT BIT
7FC6 CD CC 7F  CALL DELAY
7FC9 C9        RET
7FCC 11 01 00  DELAY LD DE,0001H
7FCF 2A 84 7E  LD HL,CYCLES GET DELAY PERIOD
7FD2 ED 52     LOOP SBC HL,DE  DECREMENT BY ONE
7FD4 20 FC     JR NZ,LOOP
7FD6 C9        RET  END OF PROGRAM

```

Program Listing 1.

```

1 REM LPRINT TO BAUDOT TTY ::: WR ::: JUNE 28,1980 16K
5 CLS:PRINT"WRITING PROGRAM---PLEASE WAIT"
7 POKE 16422,0:POKE 16423,127
10 M=32256 'FIRST BYTE OF PROTECTED MEMORY
20 READ H$
21 P$=H$
22 H=0
25 FOR I=1 TO LEN(H$)
30 A$=RIGHT$(H$,1)
40 IF A$>="A"ANDAS<="F"THENA=ASC(A$)-55 ELSE A=VAL(A$)
50 H=H+A*16[(I-1)
60 H$=LEFT$(H$,LEN(H$)-1)
70 NEXT
75 PRINTP$;" ";
80 POKE M,H
90 M=M+1
100 IF M=32390 THEN GOTO 500
105 IF M>32726 THEN END
110 GOTO 20
500 M=32512:GOTO20
999 REM MEM LOCATION 7E00
1000 DATA FF,FF,FF,FF,FF,FF,FF,FF,CA,FF,C4,C4,C4,C4,D0,FF,FF
1001 REM 7E10
1002 DATA FF,FF,FF,FF,FF,FF,FF,FF,FF,FF,FF,FF,DA,FF,FF,FF,FF
1003 REM 7E20
1004 DATA C8,DA,E2,E8,D2,D6,F4,D6,DE,E4,DA,F4,D8,C6,F8,FA
1009 REM 7E30
1010 DATA EC,EE,E6,C2,D4,E0,EA,CE,CC,F0,DC,FC,FF,FF,FF,F2
1011 REM 7E40
1012 DATA FA,C6,F2,DC,D2,C2,DA,F4,E8,CC,D6,DE,E4,F8,D8,F0
1013 REM 7E50
1014 DATA EC,EE,D4,CA,E0,CE,FC,E6,FA,EA,E2,DA,FF,FF,C8,FE
1019 REM 7E60
1020 DATA FE,C6,F2,DC,D2,C2,DA,F4,E8,CC,D6,DE,E4,F8,D8,F0
1021 REM 7E70
1022 DATA EC,EE,D4,CA,E0,CE,FC,E6,FA,EA,E2,FF,FF,FF,FE
1029 REM 7E80 THRU 7E85
1030 DATA 00,00,00,7E,A0,05
1039 REM 7F00
1040 DATA 79,E6,7F,FE,0D,CA,AA,7F,FE,25,28,62,FE,20,28,67
1041 REM 7F10
1042 DATA FE,3C,28,6C,FE,3D,28,73,FE,3E,28,7A,FE,5B,CA,A1
1043 REM 7F20
1044 DATA 7F,FD,21,00,7E,CD,2B,7F,C3,3A,7F,F5,3A,80,7E,3C
1045 REM 7F30
1046 DATA FE,49,CC,AA,7F,32,80,7E,F1,C9,32,82,7E,FE,41,30
1047 REM 7F40
1048 DATA 11,FD,CB,81,46,28,1C,DD,2A,82,7E,DD,7E,00,CD,BA
1049 REM 7F50
1050 DATA 7F,C9,FD,CB,81,46,28,EF,FD,CB,81,86,3E,FE,CD,BA
1051 REM 7F60
1052 DATA 7F,18,E4,FD,CB,81,C6,3E,F6,CD,BA,7F,18,D9,3E,25
1053 REM 7F70
1054 DATA CD,25,7F,CD,47,7F,C9,3E,C8,CD,2B,7F,CD,BA,7F,C9
1055 REM 7F80
1056 DATA 3E,4C,CD,25,7F,3E,54,CD,25,7F,C9,3E,45,CD,25,7F
1057 REM 7F90
1058 DATA 3E,51,CD,25,7F,C9,3E,47,CD,25,7F,3E,54,CD,25,7F
1059 REM 7FA0
1060 DATA C9,3E,1B,CD,25,7F,CD,47,7F,C9,3E,D0,CD,BA,7F,3E
1061 REM 7FB0
1062 DATA C4,CD,BA,7F,3E,00,32,80,7E,C9,06,07,F5,E6,01,EE
1063 REM 7FC0
1064 DATA 01,D3,FF,F1,CB,2F,CD,CC,7F,10,F1,C9,11,01,00,2A
1065 REM 7FD0
1066 DATA 84,7E,ED,52,20,FC,C9
1070 END

```

Program Listing 2.

Color Computer News

Color Computer News is the first and only magazine devoted to the users of Radio Shack's Color Computer. **Color Computer News** allows CC users to have a source of information about their machine plus forums for the exchange of ideas, discoveries, helps, and complaints. **CCN** is published every other month and contains features like 6809 Assembler programming, Novice Basic, Advanced Basic, Letters and Technical Forums. **CCN** reviews current products for the Color Computer and tells the truth about them, good or bad.

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• **POS DAISY-WHEEL PRINTER INTERFACE for TRS-80** - Will drive Diablo HyType I, HyType II, and Qume Q and Sprint 3 printers. Includes 1K user-available memory for custom print routines (such as graphics, bidirectional printing, etc.). Programmed to respond to print commands from BASIC ELECTRIC PENCIL™ and SCRIPSIT™ software. Draws its power from printer. Ship wt.: 5 lbs. Price \$250.00
Cables, each (Specify HyType I, HyType II, or Qume) \$ 25.00

• **POS ASCII INTERFACE for IBM I/O SELECTRIC** This Centronics-style parallel printer interface will drive an IBM Model 731 or 735 I/O typewriter (EBCD and Correspondence codes). No software needed. Features on-board EPROM which holds up to 8 ASCII-to-IBM code tables for different type spheres. Closed-loop operation runs at maximum printer speed; stops and starts on a single character without loss of data. Requires +12VDC and +5VDC power source. Ship wt.: 5 lbs. Price \$249.95
Power Supply (+5VDC, +12VDC, +24VDC for Solenoids on Printer) \$ 49.95

• **CONVERT OFFICE ELECTRIC TO I/O TYPEWRITER** Kit includes assembled solenoids, switches, wire harness, magnet driver PCB plus instructions for installation and mCPU interface. Price \$150.00

• **"FORMALINER" Variable Width Forms Tractor for 15" Selectrics** . . . \$95.00

• **GTE Model 560 ASCII SELECTRIC I/O Terminal** With RS-232 Serial Interface and digital cassette deck for use as memory typewriter. Ship wt.: 100 lbs. Price, tested and adjusted \$1,195.00

• **POS ASCII IBM SELECTRIC PRINTER** 15" Selectric from GTE terminal cleaned and adjusted with POS Centronics-style ASCII printer interface. UC/LC, carbon and fabric ribbons. Compatible with TRS-8Q, Apple, SOL and other CPU parallel printer ports. Ship wt.: 75 lbs. Price \$895.00

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TAB132 is a machine language routine which occupies 100 bytes of memory, and will operate with either Level II or Disk Basic on the TRS-80 Model I. The TAB132 tape or disk includes modules for several different modes of operation. It can be loaded in the System mode or from DOS, can be loaded and run as a Basic program or merged into your Basic program and activated with a single GOSUB at the beginning of the program. System and DOS modules include a relocating loader to move TAB132 to anywhere in memory. Also supplied is a program which will patch the routine permanently into Disk Basic. Specify media when ordering.

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80M-11

A financial trend monitor for credit unions.

State of the Union

R. M. Reid, Jr.
6519 Velasco
Dallas, TX 75214

Credit union managers and directors spend a lot of time analyzing financial data. Many methods are used to determine the relative health of the organization, and one of the most popular is the calculation of ratios between items appearing on financial statements.

The consistent calculation of a significant number of relationships can be time consuming, especially since the results are most indicative when compared with previous relationships so trends can be detected.

An excellent discussion of some of the most significant indicators is presented in the August 1979 issue of *Credit Union Executive* magazine. The trend-monitoring sheet suggested in that article was adopted by the credit union of which I am a member and resulted in the preparation of this program.

The data for the program is obtained directly from the regular financial statements prepared by the credit union staff. Our credit union uses the account number structure recommended in the credit union accounting manual published by

the National Credit Union Administration. I included these account numbers in the input requests so the information would be easier for me to locate and input. A sample financial and statistical report is shown in Fig. 1.

A sample of the output report used by the managers and directors is shown in Fig. 2. The tabular presentation makes it easy to scan the data for each indicator to see if significant trends are developing.

Ratios and Indicators

The ratios and indicators calculated by the program are as follows:

- The rate of return on assets is the total income earned during the period divided by average total assets, then annualized and multiplied by 100 to give a percentage answer.

- The rate of return on loans to members is the total loan interest received during the period divided by average total loans outstanding, annualized and converted to a percentage.

- The expense-to-income ratio represents the total operating expenses to date divided by total operating income to date.

- The percent loans-to-shares are 100 times total loans divided by total shares.

- The maximum allowable dividend rate is one calculation you might want to adjust so it fits the conditions of your credit union. As written, the program

calculates 95 percent of the net operating income divided by 94 percent of total shares. This calculation assumes that five percent of net income must be put in reserves (thus the .95 multiplier) and that only 94 percent of total shares will be eligible for dividends. The 94 percent factor results from the way we calculate dividends and is a factor we learn from experience. You may edit program line 650 to include factors more applicable to your situation.

- The loans-to-assets ratio is the total loans outstanding divided by total assets.

- The reserves-to-delinquency ratio is the total reserves divided by the dollar amount of delinquencies.

- The percent reserves-to-loans are 100 times the sum of total reserves plus the allowance for loan losses divided by total loans.

- The percent liquidity reserve, depending on your investment portfolio, might also require some adjustment to fit your particular situation. The program is intended to calculate the product of 100 times cash plus all investments with maturities of less than one year, divided by total shares not pledged as loan collateral. As written, it will include all investments in Jumbo CD's, because all our investments of this type have shorter-term maturities.

- The liquidation value of members' shares calculates whether members could antici-

pate receiving 100 percent of their shares if the credit union were liquidated. It is obtained by subtracting anticipated loan losses from the sum of shares and reserves, then dividing the result by total shares and multiplying the result by 100. Obviously, the indicator should never fall below 100, or the credit union is insolvent.

- The percent delinquencies-to-loans is calculated in dollars (delinquent amount divided by total loans) and number (number of delinquent loans divided by the number of loans outstanding). A comparison of these two measures can yield some information about the relative sizes of the delinquencies.

- The percent of members borrowing is the number of loans outstanding divided by the total number of members—a rough measure of member service.

- The loan turnover ratio is a measure of the rate at which loans turn over per year. It is the annualized quotient of total loans granted year-to-date divided by the average loans outstanding during the period.

- The average loan account balance is the total outstanding loan amount divided by the number of loans.

- The annual membership growth represents the annualized net increase in total membership year-to-date.

- The annual savings growth is the dollar growth in total shares on an annual basis. The

annualized growth indicators are possibly most useful in preparing budgets for future periods.

● The average share balance is the total shares divided by total membership. It is a measure of members' saving habits.

● The average annual savings per member is calculated by annualizing the year-to-date

increase in total shares divided by the average membership during the period.

● Shares are determined by dividing the dollar amount in the money market certificates by the amount of total shares. As we began to offer money market share certificates in amounts over \$10,000, we were concerned that the percent of total shares

earning the higher interest rates might be worth watching.

The Program

The program proceeds with a minimum of jumps and no sub-routines. Table 1 contains a list of all numerical variables used. In Program Listing 1, line 100 fulfills the necessary housekeeping duties. Lines 110-170 ask if

you are about to make the first entries for a new year. If so, you are asked for the year and some beginning data. Since several of the indicators are calculated on an annualized basis, these previous year-end numbers are necessary.

If the answer to the line 110 question is that you are going to add data to a file, then line 180

FINANCIAL AND STATISTICAL REPORT							
For Period Ended _____ 19 _____				Charter No. _____			
ADDRESS _____							
STREET AND NUMBER			CITY AND STATE			ZIP CODE	
STATEMENT OF FINANCIAL CONDITION				STATEMENT OF INCOME			
ACCT. NO.	ASSETS	END OF THIS PERIOD		ACCT. NO.	OPERATING INCOME	THIS MONTH	YEAR TO DATE
701	Loans			111	Interest on Loans		
				113	Income from Loans of Liq. CUs		
					Total		
712	Loans Pur. from Liq. CUs (Less Disc.)			119	Less - Interest Refund		
					Net		
	Total			121	Income from Investments		
719	Less - Allowance for Loan Losses			131	Fees and Charges		
	Net			151	Misc. Operating Income		
730	Cash				Total Operating Income		
740	Investments				OPERATING EXPENSES		
				210	Compensation		
				220	Employee Benefits		
				230	Travel & Conference Expenses		
				240	Association Dues		
				250	Office Occupancy Expenses		
				260	Office Operations Expenses		
752	Accrued Income on Investments			270	Educ. & Promotional Exp.		
760	Prepaid and Deferred Expenses			280	Loan Servicing Expenses		
774.5	Furniture & Equipment (net)			290	Prof. & Outside Services		
				300	Provision for Loan Losses		
790	Other Assets			310	Members' Insurance		
				320	Fed. Supvr. & Exam Exp.		
	TOTAL ASSETS			330	Cash Over and Short		
	LIABILITIES AND EQUITY			340	Int. on Borrowed Money		
801	Accounts Payable			350	Annual Meeting Expense		
				360	Misc. Operating Expenses		
820	Dividends Payable				Total Operating Expenses		
840	Taxes Payable				INCOME (Loss) FROM OPER.		
860	Other Liabilities				NON-OPERATING GAINS (Losses)		
				420	Gain (Loss) on Investments		
				430	Gain (Loss) on Disp. of Assets		
	TOTAL LIABILITIES				Total Non-Oper. Gains (Losses)		
901	Shares				Income (Loss) Before Dividends		
931	Regular Reserve			380	Dividends		
					NET INCOME (Loss)		
940	Undivided Earnings				STATISTICAL REPORT		
						NUMBER	AMOUNT
960	Net Income (Loss)			1.	Delinquent Loans		
	TOTAL EQUITY			a.	2 to less than 6 months		
	TOTAL LIAB. & EQUITY			b.	6 to less than 12 months		
				c.	12 months and over		
				d.	Subtotal		
				2.	Current & Less than 2 mos. delq.		
				3.	Total Loans		
				4.	Loans made:		
				a.	Loans made year to date		
				b.	Loans made since org.		
				5.	No. Members' & Nonmembers' Accounts at End of Period		
				6.	No. of potential members		
				7.	Loans chgd. off since org.		
				8.	Recov. on loans charged off Since Organization		

We certify that, to the best of our knowledge and belief, this report is true and correct and presents fairly the financial position and the results of operations for the periods covered.

Treas. _____

Official: _____

CU-10056 (May77)

Fig. 1. Typical Financial and Statistical Report.

**E-SYSTEMS GARLAND FEDERAL CREDIT UNION
MONTHLY INDICATORS
1980**

	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
ANNUAL RATE OF RETURN ON TOTAL ASSETS	13.45	11.82	10.47	11.25	11.18	10.48	10.76	10.55	10.37	10.62	0.00	0.00
ANNUAL RATE OF RETURN ON LOANS TO MEMBERS	14.33	12.85	12.15	12.23	12.26	12.09	12.17	12.21	12.10	12.34	0.00	0.00
ACTUAL EXPENSE-INCOME RATIO TO DATE	0.30	0.26	0.27	0.25	0.24	0.27	0.26	0.25	0.27	0.26	0.00	0.00
PERCENT LOANS-TO-SHARES	79.22	78.80	78.44	81.58	78.74	75.97	73.24	69.89	67.36	64.80	0.00	0.00
MAXIMUM ALLOWABLE DIVIDEND RATE YEAR-TO-DATE	10.16	9.40	8.18	9.23	9.32	8.24	8.52	8.33	7.86	8.05	0.00	0.00
LOANS-TO-ASSETS RATIO	0.75	0.74	0.73	0.77	0.74	0.71	0.69	0.65	0.63	0.61	0.00	0.00
RESERVES-TO-DELINQUENCY RATIO	15.85	10.99	20.14	16.12	13.94	9.18	10.63	10.04	18.40	17.25	0.00	0.00
PERCENT RESERVES-TO-LOANS	4.66	4.75	4.66	4.82	4.91	5.07	5.13	5.23	5.15	5.53	0.00	0.00
PERCENT LIQUIDITY RESERVE (5% MIN)	9.17	10.35	11.71	7.12	10.92	14.63	18.22	22.06	25.54	27.25	0.00	0.00
LIQUIDATION VALUE OF MEMBERS' SHARES	103.50	103.51	103.49	103.75	103.68	103.52	103.43	103.34	103.35	103.44	0.00	0.00
PERCENT DELINQUENCIES-TO-LOANS (\$)	0.29	0.42	0.23	0.29	0.34	0.53	0.46	0.50	0.28	0.31	0.00	0.00
PERCENT DELINQUENCIES-TO-LOANS (QTY)	0.48	0.62	0.42	0.52	0.61	0.70	0.93	1.03	0.66	0.80	0.00	0.00
PERCENT OF MEMBERS BORROWING	63.33	63.54	63.99	63.74	63.29	63.42	62.91	62.56	61.72	60.38	0.00	0.00
LOAN TURNOVER RATIO (YEARS)	0.72	0.74	0.81	0.85	0.82	0.82	0.84	0.83	0.84	0.85	0.00	0.00
AVERAGE LOAN ACCOUNT BALANCE	2465	2416	2401	2377	2351	2302	2263	2222	2206	2161	0	0
ANNUAL MEMBERSHIP GROWTH	420	276	304	291	225	234	282	268	284	303	0	0
ANNUAL SAVINGS GROWTH (\$ X 1000)	-843	-722	-106	-982	-533	-146	163	417	608	615	0	0
AVERAGE SHARE BALANCE	1970	1948	1959	1857	1890	1921	1944	1989	2021	2014	0	0
AVERAGE ANNUAL SAVINGS PER MEMBER	-257.91	-220.68	-32.24	-297.75	-161.64	-44.07	48.99	125.23	181.52	182.40	0.00	0.00
CERTIFICATES/TOTAL SHARES	0.13	0.15	0.18	0.23	0.21	0.21	0.23	0.23	0.22	0.23	0.00	0.00

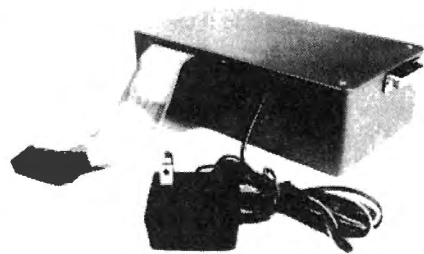
Fig. 2. Sample Output Report.

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NEW MODEL UPI-3 SERIAL PRINTER INTERFACE MAKES IT POSSIBLE TO CONNECT AN ASCII SERIAL PRINTER TO THE PARALLEL PRINTER PORT ON THE TRS-80.

Software compatibility problems are totally eliminated because the TRS-80 "THINKS" that it has a parallel printer attached. NO MACHINE LANGUAGE DRIVER NEEDS TO BE LOADED INTO HIGH MEMORY BECAUSE THE DRIVER ROUTINE FOR THE UPI-3 IS ALREADY IN THE TRS80 ROM! SCRIPSIT, PENCIL, RSM 2, ST80D, NEWDOS, FORTRAN, BASIC etc. all work as if a parallel printer was in use.

The UPI-3 is completely self contained and ready to use. A 34 conductor edge card connector plugs onto the parallel printer port of the model I Expansion Interface or onto the parallel printer port on the TRS-80 III. A DB25 socket mates with the cable from your serial printer. The UPI-3 converts the parallel output of the TRS-80 printer port into serial data in both the RS232-C and 20 MA. loop formats.



Switch selectable options include:

- Linefeed after Carriage Return
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- Nulls after Carriage Return
- 7 or 8 Data Bits per word
- 1 or 2 Stop Bits per Word
- Parity or No parity
- ODD or EVEN Parity

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obtains all previous data from the disk.

Lines 200-360 ask for data from the balance sheet. You are reminded to make all entries in whole-dollars. You also should omit all commas from the dollar entries.

Lines 370-410 ask for data from the income statement, and you are reminded to use year-to-date figures. The year-to-date data is necessary because some of the indicators are annual projections based on the average performance from the beginning of the year through the latest entry.

Lines 420-500 ask for data from the statistical report plus one item—shares pledged as loan collateral—that does not appear on any financial report. This last item is necessary for the computation of percent liquidity reserve. The minimum value for this reserve in federal credit unions is five percent, so the board of directors will want to watch the reserve very closely when it approaches the borderline.

Lines 600-720 contain most of the computations in the program. The only exceptions are some totals and multiple-use factors that were calculated at the time of input. (Refer to lines 220, 300 and 360.) The arithmetic is relatively straightforward.

Lines 730-770 permit you to enter data for as many months as you wish before printing the results. When you have finished entering data, the program proceeds immediately to print the results.

The print routine is contained in lines 900-1250. Lines 900, 910 and 915 are the three major print formats. Line 900 is the format for most indicators that are expressed as a number with two possible decimal places. Line 910 is used for those indicators that are always whole numbers. Line 915 is almost the same as line 900, except it allows four digits prior to the decimal point. This format is necessary for the larger results in the "average annual savings per member" calculation.

Lines 980, 990 and 1000 may

Variable	Definition
A	Total Assets
AA	Average Assets
AL	Average Loans
AS	Average Shares
BA	Beginning Assets
BL	Beginning Loans
BM	Beginning Number of Members
BS	Beginning Shares
C	Cash
CT	Common Trust Investments
CU	Deposits and Shares in Other Credit Unions
DA	Delinquent Loan Amount
E	Annualizer
F	Annualizer times 100
FA	Federal Agency Securities
I	Interest on Loans
L	Loans Outstanding
LA	Loan Amount, Year-to-Date
LL	Allowance for Loan Losses
MM	Money Market Certificate Investments
N	Month Number
ND	Number of Delinquent Loans
NM	Number of Members
OE	Total Operating Expense
OI	Total Operating Income
PS	Pledged Shares
RC	Reserve for Contingency
RR	Regular Reserve
S	Regular Shares
SC	Money Market Share Certificates
ST	Investments With Maturities Less Than One Year
TI	Total Investments
TL	Total Number of Loans
TR	Total Reserves
TS	Total Shares
X	Counter
Y	Year
Z	Counter

Table 1. Definition of Variables.

EPSON

MX-80

EPSON

MX-70

EPSON

EPSON

MX-100

MX-80 FT

MX-80

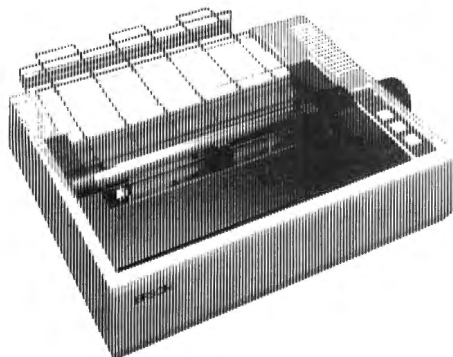
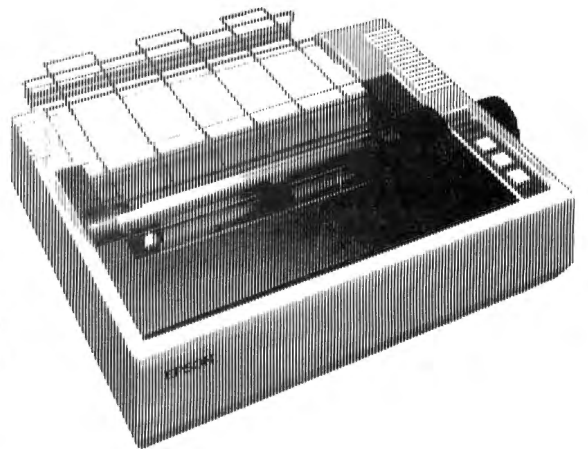
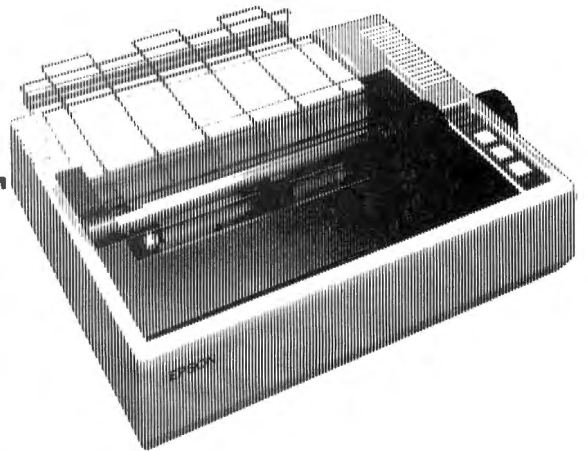
MX-80 FT

MX-100

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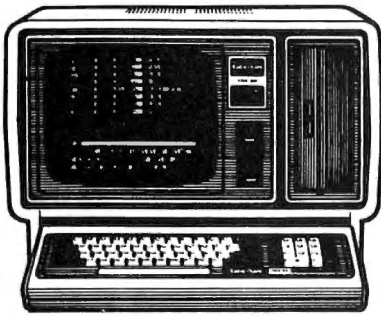
529

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- Repair HIT and GAT sectors and Boot
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- Read protect, un-read protect or move directory
- Clear unused entries
- Advises of all inactive files

MEMORY

- Display, move, test, compare, zero, exchange, input or output a byte to any port
- Exchange, jump to, reverse, fill, string search or load/write entire sectors to/from memory

FILE

- Display, compare and copy file sectors
- Locate free space, files, drive status
- Create files and clear files from disk

CONFIGURE SYSTEM

- Custom configure S/U Plus to your system
- Single or double density in any combination, 5" drives, select your operating system boot, upper or lower case, high speed clock, single or double headed drives, or configure your pnntr

require modification for your particular printer. I use an IDS-440 Paper Tiger and some of my commands might not be necessary with other printers. The command LPRINTCHR\$(31) in line 980 is a control command that adjusts the line length to 132 characters. The command LPRINTCHR\$(01) in the same line switches the printer to an enhanced printing mode so the report heading will appear to be in larger and bolder type. The command LPRINTCHR\$(02) in line 1000 returns the printer to

normal characters.

You would, of course, want to change line 980 so the name of your organization is printed at the top of your reports. You also probably will wish to revise the tabs in lines 980, 990 and 1000 to adjust the heading. Lines 1300-1320 record all your latest data on the disk, and line 1400 ends the program.

I hope you find this program as useful to your credit union as it has been to mine. I would be interested in hearing your comments or questions. ■

Program Listing

```

10 *****
15 **
20 ** MONTHLY INDICATORS **
25 ** OF **
30 ** CREDIT UNION PERFORMANCE **
35 **
40 **
45 ** MARK REID **
50 ** 6519 VELASCO **
55 ** DALLAS, TX 75214 **
60 **
65 *****
100 CLEAR900:DIMP(12,20):DEFINTX,Y,Z
110 CLS:PRINT"IS THIS THE BEGINNING OF A NEW YEAR (Y/N)?
115 Z$=INKEY$:IF Z$="" THEN 115
120 IF Z$="N" THEN 100
125 IF Z$="Y" THEN 130
127 REM
128 REM * * * * * INPUT FIRST-OF-YEAR DATA * * * * *
129 REM
130 CLS:PRINT"MAKE ALL FINANCIAL ENTRIES IN WHOLE DOLLARS":PRINT
:INPUT"WHAT YEAR ARE YOU BEGINNING";Y
140 INPUT"BEGINNING LOANS";BL
150 INPUT"BEGINNING ASSETS";BA
160 INPUT"BEGINNING SHARES";BS
170 INPUT"BEGINNING NUMBER OF MEMBERS";BM:GOTO200
177 REM
178 REM * * * * * READ DATA FROM DISK * * * * *
179 REM
180 OPEN"1",1,"CU/DAT":INPUT#1,Y,BL,BA,BS,BM:FORX=1TO12:FORZ=1TO
20:INPUT#1,P(X,Z):NEXTZ:NEXTX:CLOSE1
200 CLS:PRINT"REMEMBER TO MAKE ALL FINANCIAL ENTRIES IN WHOLE DO
LLARS":PRINT
207 REM
208 REM * * * * * INPUT BALANCE SHEET DATA * * * * *
209 REM
210 PRINT"INPUT THE FOLLOWING DATA FROM YOUR BALANCE SHEET"
220 INPUT"MONTH NO.":N:E=12/N:F=1200/N
230 INPUT"LOANS OUTSTANDING, ACCT 701";L
240 INPUT"ALLOWANCE FOR LOAN LOSSES, ACCT 719";LL
250 INPUT"CASH, ACCT 730";C
260 INPUT"FEDERAL AGENCY SECURITIES, ACCT 742";FA
270 INPUT"COMMON TRUST INVESTMENTS, ACCT 743";CT
280 INPUT"SHARES, DEPOSITS, CERTS - OTHER CU'S, ACCT 745";CU
290 INPUT"OTHER SHARES, DEPOSITS CERTIFICATES, ACCT 746";MM
300 T=FA+CT+CU+MM:ST=CT+CU+MM
310 INPUT"TOTAL ASSETS";A
320 INPUT"REGULAR SHARES, ACCT 901";S
330 INPUT"MM SHARE CERTIFICATES, ACCT 900";SC
340 INPUT"REGULAR RESERVES, ACCT 931";RR
350 INPUT"RESERVE FOR CONTINGENCIES, ACCT 933";RC
360 TR=RR+RC
367 REM
368 REM * * * * * INPUT INCOME STATEMENT DATA * * * * *
369 REM
370 CLS:PRINT"INPUT THE FOLLOWING DATA FROM YOUR INCOME STATEMEN
T"
380 PRINT"BE SURE TO USE YEAR-TO-DATE FIGURES":PRINT
390 INPUT"INTEREST ON LOANS, ACCT 111";I
400 INPUT"TOTAL OPERATING INCOME";OI
410 INPUT"TOTAL OPERATING EXPENSES";OE
417 REM
418 REM * * * * * INPUT STATISTICAL DATA * * * * *
419 REM
420 CLS:PRINT"INPUT THE FOLLOWING DATA FROM YOUR"
430 PRINT"STATISTICAL REPORT":PRINT
440 INPUT"NUMBER OF DELINQUENT LOANS";ND
450 INPUT"DELINQUENT AMOUNT";DA
460 INPUT"TOTAL NUMBER OF LOANS";TL
470 INPUT"LOAN AMOUNT, YEAR TO DATE";LA
480 INPUT"NUMBER OF MEMBERS";NM
490 PRINT"YOU WILL PROBABLY HAVE TO SEE YOUR BOOKKEEPER FOR"
500 INPUT"SHARES PLEDGED AS LOAN COLLATERAL";PS
507 REM
508 REM * * * * * COMPUTATIONS * * * * *
509 REM
600 TS=S+SC:AS=(BS+TS)/2:AL=(BL+L)/2:AA=(BA+A)/2
610 P(N,0)=(OI/AA)*F:P(N,1)=(INT(P(N,0)*100+.5))/100
620 P(N,0)=(I/AL)*F:P(N,2)=(INT(P(N,0)*100+.5))/100
630 P(N,0)=OE/OI:P(N,3)=(INT(P(N,0)*100+.5))/100
640 P(N,0)=(L/TS)*100:P(N,4)=(INT(P(N,0)*100+.5))/100
650 P(N,0)=.95*F*(OI/OE)/(.94*TS):P(N,5)=(INT(P(N,0)*100+.5))/10
0

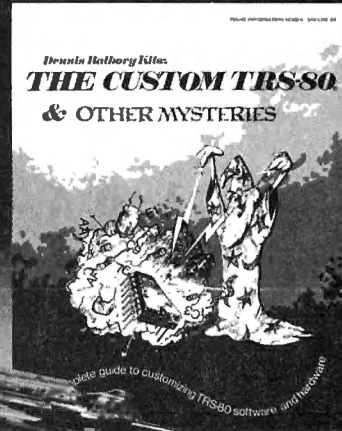
```

Program continues

Program continued

```
660 P(N,0)=L/A:P(N,6)=(INT(P(N,0)*100+.5))/100
670 P(N,0)=TR/DA:P(N,7)=(INT(P(N,0)*100+.5))/100
680 P(N,0)=100*(TR+LL)/L:P(N,8)=(INT(P(N,0)*100+.5))/100
690 P(N,0)=100*(C+ST)/(TS-PS):P(N,9)=(INT(P(N,0)*100+.5))/100
700 P(N,0)=100*(TS+TR-LL)/TS:P(N,10)=(INT(P(N,0)*100+.5))/100
710 P(N,0)=100*DA/L:P(N,11)=(INT(P(N,0)*100+.5))/100
712 P(N,0)=100*ND/TL:P(N,12)=(INT(P(N,0)*100+.5))/100
713 P(N,0)=100*TL/NM:P(N,13)=(INT(P(N,0)*100+.5))/100
714 P(N,0)=(LA/AL)*E:P(N,14)=(INT(P(N,0)*100+.5))/100
715 P(N,0)=L/TL:P(N,15)=INT(P(N,0))
716 P(N,0)=(NM-DM)*E:P(N,16)=INT(P(N,0))
717 P(N,0)=(TS-BS)*E:P(N,17)=INT(P(N,0)/1000)
718 P(N,0)=TS/NM:P(N,18)=INT(P(N,0))
719 P(N,0)=E*(TS-BS)/(SM+NM)/2:P(N,19)=(INT(P(N,0)*100+.5))/100
720 P(N,0)=SC/TS:P(N,20)=(INT(P(N,0)*100+.5))/100
730 PRINT"WOULD YOU LIKE TO INPUT DATA FOR"
740 PRINT"ANOTHER MONTH AT THIS TIME?"
750 Z$=INKEY$:IF Z$="" THEN 750
760 IF Z$="N" THEN 900
770 IF Z$="Y" THEN 200
897 REM
898 REM * * * * * OUTPUT FORMATS * * * * *
899 REM
900 P1$=""
901 P1$=""
902 P1$=""
903 P1$=""
904 P1$=""
905 P1$=""
906 P1$=""
907 P1$=""
908 P1$=""
909 P1$=""
910 P2$=""
911 P2$=""
912 P2$=""
913 P2$=""
914 P2$=""
915 P3$=""
916 P3$=""
917 P3$=""
918 P3$=""
919 P3$=""
977 REM
978 REM * * * * * FORM HEADING * * * * *
979 REM
980 LPRINTCHR$(31):LPRINTCHR$(01):LPRINTTAB(18)"E-SYSTEMS GARLAN
D FEDERAL CREDIT UNION
990 LPRINTTAB(20)"MONTHLY INDICATORS
1000 LPRINTTAB(34)Y:LPRINTCHR$(02)
1010 LPRINT"
MAR APR MAY JUNE JULY AUG SEPT FEB
NOV DEC OCT
1020 LPRINTSTRING$(131,"-")
1027 REM
1028 REM * * * * * PRINT ROUTINE * * * * *
1029 REM
1030 LPRINTUSINGP1$;"ANNUAL RATE OF RETURN ON";P(1,1);P(2,1);P(3
,1);P(4,1);P(5,1);P(6,1);P(7,1);P(8,1);P(9,1);P(10,1);P(11,1);P(
12,1)
1040 LPRINT" TOTAL ASSETS"
1050 LPRINTUSINGP1$;"ANNUAL RATE OF RETURN ON";P(1,2);P(2,2);P(3
,2);P(4,2);P(5,2);P(6,2);P(7,2);P(8,2);P(9,2);P(10,2);P(11,2);P(
12,2)
1060 LPRINT" LOANS TO MEMBERS"
1070 LPRINTUSINGP1$;"ACTUAL EXPENSE/INCOME RATIO";P(1,3);P(2,3);
P(3,3);P(4,3);P(5,3);P(6,3);P(7,3);P(8,3);P(9,3);P(10,3);P(11,3);
P(12,3):LPRINT" TO DATE"
1080 LPRINTUSINGP1$;"PERCENT LOANS TO SHARES";P(1,4);P(2,4);P(3,
4);P(4,4);P(5,4);P(6,4);P(7,4);P(8,4);P(9,4);P(10,4);P(11,4);P(1
2,4):LPRINT
1090 LPRINTUSINGP1$;"MAXIMUM ALLOWABLE DIVIDEND RATE";P(1,5);P(2
,5);P(3,5);P(4,5);P(5,5);P(6,5);P(7,5);P(8,5);P(9,5);P(10,5);P(1
1,5);P(12,5)
1100 LPRINT" YEAR TO DATE"
1110 LPRINTUSINGP1$;"LOANS TO ASSETS RATIO";P(1,6);P(2,6);P(3,6)
;P(4,6);P(5,6);P(6,6);P(7,6);P(8,6);P(9,6);P(10,6);P(11,6);P(12
,6):LPRINT
1120 LPRINTUSINGP1$;"RESERVES TO DELINQUENCY RATIO";P(1,7);P(2,7
);P(3,7);P(4,7);P(5,7);P(6,7);P(7,7);P(8,7);P(9,7);P(10,7);P(11
,7);P(12,7):LPRINT
1130 LPRINTUSINGP1$;"PERCENT RESERVES TO LOANS";P(1,8);P(2,8);P(
3,8);P(4,8);P(5,8);P(6,8);P(7,8);P(8,8);P(9,8);P(10,8);P(11,8);P(
12,8):LPRINT
1140 LPRINTUSINGP1$;"PERCENT LIQUIDITY RESERVE (5% MIN)";P(1,9);
P(2,9);P(3,9);P(4,9);P(5,9);P(6,9);P(7,9);P(8,9);P(9,9);P(10,9);
P(11,9);P(12,9):LPRINT
1150 LPRINTUSINGP1$;"LIQUIDATION VALUE OF MEMBERS";P(1,10);P(2,
10);P(3,10);P(4,10);P(5,10);P(6,10);P(7,10);P(8,10);P(9,10);P(10
,10);P(11,10);P(12,10):LPRINT" SHARES"
1160 LPRINTUSINGP1$;"PERCENT DELINQUENCIES TO LOANS ($)";P(1,11)
;P(2,11);P(3,11);P(4,11);P(5,11);P(6,11);P(7,11);P(8,11);P(9,11)
;P(10,11);P(11,11);P(12,11):LPRINT
1170 LPRINTUSINGP1$;"PERCENT DELINQUENCIES TO LOANS";P(1,12);P(2
,12);P(3,12);P(4,12);P(5,12);P(6,12);P(7,12);P(8,12);P(9,12);P(1
0,12);P(11,12);P(12,12):LPRINT" (QTY)"
1180 LPRINTUSINGP1$;"PERCENT OF MEMBERS BORROWING";P(1,13);P(2,1
3);P(3,13);P(4,13);P(5,13);P(6,13);P(7,13);P(8,13);P(9,13);P(10
,13);P(11,13);P(12,13):LPRINT
1190 LPRINTUSINGP1$;"LOAN TURNOVER RATIO (YEARS)";P(1,14);P(2,14
);P(3,14);P(4,14);P(5,14);P(6,14);P(7,14);P(8,14);P(9,14);P(10,1
4);P(11,14);P(12,14):LPRINT
1200 LPRINTUSINGP2$;"AVERAGE LOAN ACCOUNT BALANCE";P(1,15);P(2,1
5);P(3,15);P(4,15);P(5,15);P(6,15);P(7,15);P(8,15);P(9,15);P(10
,15);P(11,15);P(12,15):LPRINT
1210 LPRINTUSINGP2$;"ANNUAL MEMBERSHIP GROWTH";P(1,16);P(2,16);P(
3,16);P(4,16);P(5,16);P(6,16);P(7,16);P(8,16);P(9,16);P(10,16);
P(11,16);P(12,16):LPRINT
1220 LPRINTUSINGP2$;"ANNUAL SAVINGS GROWTH ($ X 1000)";P(1,17);P(
2,17);P(3,17);P(4,17);P(5,17);P(6,17);P(7,17);P(8,17);P(9,17);P(
10,17);P(11,17);P(12,17):LPRINT
1230 LPRINTUSINGP2$;"AVERAGE SHARE BALANCE";P(1,18);P(2,18);P(3
,18);P(4,18);P(5,18);P(6,18);P(7,18);P(8,18);P(9,18);P(10,18);P(1
1,18);P(12,18):LPRINT
1240 LPRINTUSINGP3$;"AVERAGE ANNUAL SAVINGS PER MEMBER";P(1,19);
P(2,19);P(3,19);P(4,19);P(5,19);P(6,19);P(7,19);P(8,19);P(9,19);
P(10,19);P(11,19);P(12,19):LPRINT
1250 LPRINTUSINGP1$;"CERTIFICATES/TOTAL SHARES";P(1,20);P(2,20);
P(3,20);P(4,20);P(5,20);P(6,20);P(7,20);P(8,20);P(9,20);P(10,20)
;P(11,20);P(12,20)
1297 REM
1298 REM * * * * * SAVE DATA ON DISK * * * * *
1299 REM
1300 OPEN"O",1,"CU/DAT":PRINT#1,Y,BL,BA,BS,BM
1310 FORK=LTO12:FORZ=LTO20
1320 PRINT#1,P(X,Z);",":NEXTZ:NEXTX:CLOSE1
1400 END
```

EXCUSES, EXCUSES...



IJG would like to apologize to all readers, and dealers, who ordered *The Custom TRS-80* and have been wondering where it is.

Magazine advertisements have to be prepared 2 to 3 months before they actually appear in print. Originally the book was scheduled for printing in early May, just as the first advertisements were to appear, but the Editor must have been in a time-warp when he made the original production estimates!

He completely under-estimated the time needed to prepare and process the dozens of photographs, circuit diagrams, printed circuit layouts, assembly language programs and reams of information that Dennis Kitz had provided.

The book has now been scheduled for printing in early November, and should be available before the end of the month. It will be worth the wait, it's one heck of a book!

Credit card orders are not being processed until the book is back from the printers. If you prepaid by check, and would prefer not to wait, then you can obtain a full refund prior to shipment - or use your credit towards other IJG products.

Sorry about this, thank you for waiting,

Jim Perry

Jim ('What year is it?') Perry, Editor



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TRS-80 is a trademark of Tandy

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Colorful Maneuvers

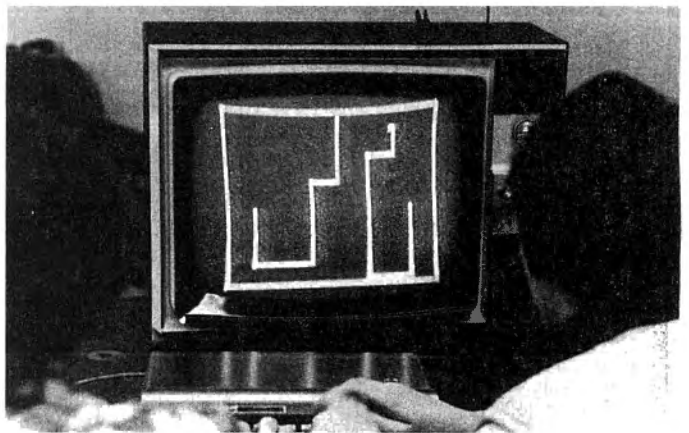
James W. Wood
424 N. Missouri, Box 507
Atwood, IL 61913

Tired of running games that involve no decisions or games in which you learn to beat the program? This game uses the computer to generate the playing field and rapidly lengthens two player's lines till one runs into something. You cannot predict your opponent's

strategy. Will he attack and try to surround you, or will he just try to stay in the open with lots of running room?

I bought one version of this game in a book, but it didn't work. One player could permanently block the other by holding down a key. In my program if pushing a letter doesn't change your direction, immediately release and push again. The second push will work. Many hours of study by students in my computer class have shown that the program is functional. ■

Contact the author for information on purchasing the program.



G\$	player on left
H\$	player on right
S	determines initial direction
W\$	right players input
R\$	left players input
Q\$	determines direction
U	right players starting X coordinate
V	right players starting Y coordinate
X	left players starting X coordinate
Z	left players starting Y coordinate
Y	color of line
N	directs program from left to right player
A	number of games left player won
B	number of games right player won
O	used in drawing border

Table 1. Variable List.

1-5	determine starting direction
8	determines starting position
9	draws border
10,13,101	makes it impossible for one player to permanently block keyboard
20-50 and 120-150	turns line
52,152	determines if game over
300-410	shows where game lost
1000-1170	instructions

Table 2. Line Description.

Program Listing 1. 4K Color Basic.

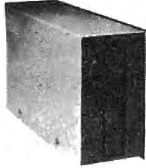
```

8 CLS:INPUT"PLAYER ON LEFT ";G$:INPUT"PLAYER ON RIGHT ";H$:GOSUB
1000
1 CLS:S=RND(4)
2 IFS=1THENW$="J":R$="A":GOTO8
3 IFS=2THENW$="L":R$="D":GOTO8
4 IFS=3THENW$="I":R$="E":GOTO8
5 W$="N":R$="C"
6 U=8:V=15:X=55:Y=15:N=1
9 CLS:Z=RND(8):FORQ=0TO63:SET(Q,0,Z):SET(Q,31,Z):NEXTQ:FORQ=0TO
31:SET(0,Q,Z):SET(63,Q,Z):NEXTQ
10 IFN=1THEN12ELSE100
12 Q$=INKEY$:IFQ$=""THENQ$=W$
13 IFASC(Q$)<70THEN102
15 W$=Q$
20 IFQ$="J"THENX=X-1:GOTO52
30 IFQ$="L"THENX=X+1:GOTO52
40 IFQ$="I"THENY=Y-1:GOTO52
50 IFQ$="N"THENY=Y+1
52 IFPOINT(X,Y)<>0THEN300
    
```

Program continues

WE WILL NOT BE UNDERSOLD

DISK DRIVES



FOR TRS-80* Model I			
CCI-100	5 1/4", 40 Track (102K)	\$299	
ADD-ON DRIVES FOR ZENITH Z-89			
CCI-189	5 1/4", 40 Track (102K)	\$389	
Z-87	Dual 5 1/4" system	\$995	

External card edge and power supply included. 90 day warranty/one year on power supply.

CORVUS	5mg \$3089	10mg \$4489	Mirror \$699
RAW DRIVES	8" SHUGART 801R		\$399
5 1/4" TANDON	\$ CALL	POWER SUPPLIES	\$ CALL

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— Box of 10			
5 1/4"	Maxell \$40	BASF/Verbatim	\$26.95
8"	Maxell \$45	BASF/Verbatim	\$36.00
PLASTIC FILE BOX—Holds 50 5 1/4" diskettes			
PLASTIC LIBRARY CASE	5 1/4" \$3.00	8"	\$ 4.00
HEAD CLEANING DISKETTE			\$25.00
FLOPPY SAVER	\$10.95	RINGS	\$ 6.95

16K RAM KITS

200ns for TRS-80*, Apple II, (specify):	2 for \$37	\$19
	Jumpers	\$2.50

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ATARI	400 \$ 359	800 \$ 789
MATTEL	INTELLIVISION	\$ 259
APPLE PERIPHERALS		\$CALL
SYSTEM SPECIAL		

Apple II Plus 48K w/drive and controller. Epson MX-80 printer and interface. SUP-R Mod RF Modulator: List \$2965 You Pay \$2295

TERMINALS

ADDS	Viewpoint	\$CALL
ZENITH	Z-19	\$ 725
TELEVIDEO	910 \$ 559	920C \$729
IBM	3101-10	\$1189

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MAINFRAME	\$359	Z80 CPU	\$ 269
64K RAM	\$599	FLOPPY DISC CNTRL	\$ 359
INTEGRATED SYSTEM W/INTERNAL CABLES, TESTED			
			\$1975
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4 PORT PARALLEL I/O			\$ 179
CABLES			\$CALL

CASIO CALCULATORS

POCKET COMPUTER	FX702	\$199.00
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SCIENTIFIC CALCULATOR	FX8100	\$ 49.95
GAME WATCH	CA90 Plastic	\$ 49.95
GAME WATCH	CA901 Steel	\$ 69.95
SPORT WATCH	AX210 Calendar	\$ 59.95

BUSINESS SOFTWARE

WORDSTAR for Apple II	\$ 329
WORDSTAR for Zenith Z89	\$ 329

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PRINTERS



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7710 R.O. Par w/tractor		\$2595
7720 KSR w/tractor		\$2795
7730 R.O. Ser		\$2395
7730 R.O. Ser w/tractor		\$2595
NEW 3500 Series		\$CALL
EPSON	MX-70	MX-80
PAPER TIGER	MX-80FT	MX100

IDS 445	Graphics & 2K buffer	\$ 639
IDS 460	Graphics & 2K buffer	\$ 799
IDS 560	Graphics	\$1049

ACCESSORIES		\$CALL
ANADEX	DP-8000 \$849	DP-9500/01 \$1295

OKIDATA

Microline 80	Friction & pin feed	\$CALL
Microline 82	Friction & pin feed	\$CALL
Microline 83	120 cps, uses up to 15" paper	\$CALL

Call for new Microline series!

CENTRONICS	739, new model with graphics	\$ 739
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C. ITOH

Starwriter I	25 cps, parallel interface	\$1439
Starwriter I	25 cps, serial interface	\$1495
Starwriter II	45 cps, parallel interface	\$1770
Starwriter II	45 cps, serial interface	\$1870
AXIOM	GP-80M	\$ 319
DATA SOUTH	180 cps	\$CALL

MONITORS

BELL & HOWELL	9" B & W BHD911	\$155
LEEDEX	12" B & W \$129	12" Green Screen \$159
	13" Color \$329	
SANYO	9" B & W \$149	12" Green Screen \$238
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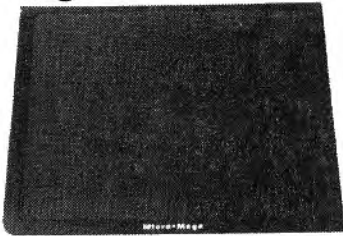
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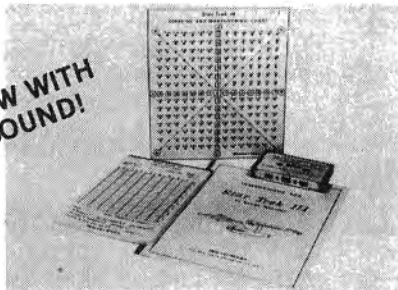
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Program continued

```
60 SET(X,Y,Z):N=2:GOTO10
100 QS=INKEY$:IFQ$=""THENQS=R$
101 IFASC(Q$)>70THENL5
102 R$=Q$
120 IFQ$="A"THENU=U-1:GOTO152
130 IFQ$="D"THENU=U+1:GOTO152
140 IFQ$="E"THENV=V-1:GOTO152
150 IFQ$="C"THENV=V+1
152 IFPOINT(U,V)<>0THEN400
160 SET(U,V,Z):N=1:GOTO10
300 SOUND200,30:FORE=1TO300:SET(X,Y,Z):RESET(X,Y):NEXT E
310 A=A+1:CLS:PRINTG$;" WINS":GOTO500
400 SOUND100,30:FORE=1TO300:SET(U,V,Z):RESET(U,V):NEXT E
410 B=B+1:CLS:PRINTH$;" WINS"
500 PRINT"TOTAL":PRINTG$;" WON";A:PRINTH$;" WON";B:FORQ=1TO600:
EXTQ:GOTO1
1000 CLS:PRINT"HOW TO TURN YOUR LINE"
1010 PRINT"PRESS THESE LETTERS FOR THE DIRECTION TO GO"
1100 PRINT
1110 PRINTG$;" ";H$
1120 PRINT" E I"
1130 PRINT" A D J L"
1140 PRINT" C N"
1142 PRINT" UP"
1143 PRINT" LEFT RIGHT"
1144 PRINT" DOWN"
1150 PRINT:PRINT"PRESS ANY KEY TO CONTINUE"
1160 Y$=INKEY$:IFY$=""THEN1160
1170 RETURN
```

```
8 U = 15:V = 24:X = 113:Y = 24:N = 1
9 CLS:FOR Q = 0 TO
127:SET(Q,0):SET(Q,47):NEXTQ:FORQ = 0TO47:SET(0,Q):SET(127,Q):NEXTQ
60 SET(X,Y):N = 2:GOTO10
180 SET(U,V):N = 1:GOTO10
300 FOR E = 1TO300:SET(X,Y):RESET(X,Y):NEXT E
400 FOR E = 1TO300:SET(U,V):RESET(U,V):NEXT E
```

Program Listing 2. Listing Change for Model I and III.

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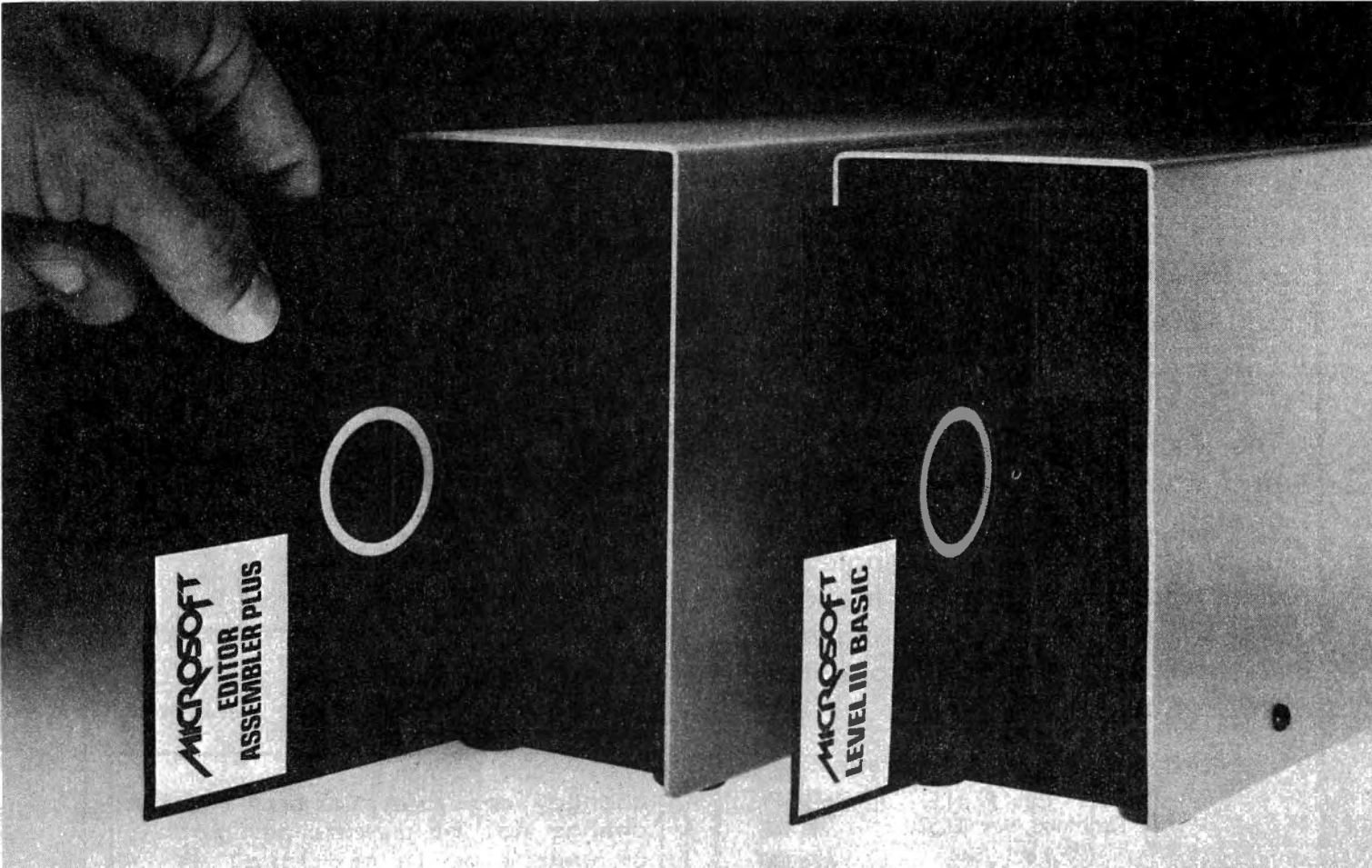
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Superlist

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Basic, the world's most popular computer language, is designed to be easy to read

and learn. But have you tried reading a fairly complex Level II program lately? To a real beginner, it might as well be machine language. At least with assembly code there is only one instruction per line.

Much can be learned about programming by reading successful programs. Unfortunately, the advantages provided by modern Basic interpreters for

microprocessors are disadvantages to the reader of Basic programs. An efficient program that takes advantage of Level II's best features is nearly impossible to read. Micros are limited in memory available, so a compact Level II program is written without spaces between words, using as many statements on a line as possible. Each space character uses one byte; line numbers use five bytes each (that goes for line 65000 as well as for line one).

I wrote my first Basic programs without the aid of a printer. I soon found myself wanting some kind of permanent record of my programs that wasn't susceptible to stray magnetism. A friend kindly offered to provide printouts in exchange for copies of my best programs. He had a disk system that would take a Basic program stored in an ASCII file and print it with each statement on a separate line. From that came the inspiration for a listing program that did not require Disk Basic.

Without a disk, the problem is more complex. Basic does not store its programs in ASCII, but in a very compact coded version using one byte "tokens" for Basic keywords. After obtaining my own printer, I quickly set about writing a program to give me readable listings using what was available in Level II.

Enter Superlist

These are the features I specified for Superlist when I first began to research Level II:

- Each line of Basic should be split at the colons, with each statement starting a new printed line.
- The printout should have margins on the left and right sides of the paper, so a listing will fit neatly in a binder.
- Jammed-together lines of Basic code should be spread out by putting a space on either side of any Basic keyword.
- At the end of the listings, the program should report its size in number of lines, statements and bytes of memory occupied by the program text.

Each of these features was realized in Superlist, along with two I hadn't expected:

- Lines containing "If...Then...Else" statements are split at the "Else" by inserting a colon before it.
- Lines with apostrophe-type remarks are split before the apostrophe with a colon.

These were a result of the way Basic stores Else statements and remarks made with an apostrophe.

How to Use Superlist

To use Superlist, you need a Level II with at least 16K of memory, a printer that uses a Radio Shack parallel interface or any serial interface, and a

```

00100 ; HERE IS A SUGGESTED PRINT ROUTINE TO USE WITH
00110 ; SUPERLIST FOR PAGED OUTPUT. THIS ROUTINE IS FOR
00120 ; THE RADIO SHACK PARALLEL PRINTER INTERFACE, AND IS SIMILAR
00130 ; TO THE ROUTINE IN LEVEL II ROM. THIS ROUTINE WILL
00140 ; GIVE YOU TWELVE BLANK LINES BETWEEN EACH PAGE OF
00150 ; 54 LINES.
00160 ;
00170 ; SET BUFF EQU 7DPEH IN MAIN SOURCE FILE FOR SUPERLIST
00180 ; OR INSERT THIS CODE FOR PRINTER ROUTINE.
00190 ;
7DB4          00200      ORG      7DB4H
7DB4 79      00210 PRINT3 LD      A,C          ;CHAR STORED IN C
7DB5 FE0C    00220      CP      12             ;FORM FEED?
7DB7 2018    00230      JR      NZ,PR1        ;NO, PRINT IT
7DB9 DD7E03  00240      LD      A,(IX+3)       ;GET LINES PER PAGE
7DBC DD9604  00250      SUB      (IX+4)       ;SUBTRACT CURRENT COUNT
7DBF 3E0C    00260 PR3   LD      A,12         ;ADD TWELVE LINES
7DC1 47      00270      LD      B,A          ;SAVE IN COUNTER
7DC2 CDEC7D  00280 PR2   CALL  READY         ;WAIT FOR PRINTER
7DC5 3E0A    00290      LD      A,18         ;LOAD A LINE FEED
7DC7 32E037  00300      LD      (37E0B),A      ;SEND IT
7DCA 1876    00310      DJNZ    PR2          ;UNTIL THROUGH
7DC8 DD360400 00320     LD      (IX+4),#      ;ZERO COUNT
7DD0 C9      00330      RET              ;THROUGH
00340 ;
7DD1 CDEC7D  00350 PR1   CALL  READY         ;HERE IF NOT FF
7DD4 79      00360      LD      A,C          ;GET BACK CHARACTER
7DD5 32E037  00370      LD      (37E0B),A      ;SEND IT
7DD8 FE0D    00380      CP      13             ;IS IT CR?
7DDA C9      00390      RET              ;NO, QUIT
7DDB DD3404  00400      INC      (IX+4)       ;BUMP LINE COUNT
7DDE DD7E04  00410      LD      A,(IX+4)       ;GET LINE COUNT
7DE1 DDBE03  00420      CP      (IX+3)       ;PAGE FULL?
7DE4 79      00430      LD      A,C          ;RESTORE CHAR
7DE5 C9      00440      RET              ;NO, QUIT
7DE6 AF      00450      XOR      A          ;YES, ZERO A
7DE7 CDBF7D  00460      CALL  PR3          ;SEND TWELVE LINES
7DEA 79      00470      LD      A,C          ;RESTORE CHAR
7DEB C9      00480      RET              ; QUIT
00490 ;
7DEC 3AE037  00490      LD      A,(37E0B)      ;GET STATUS
7DF0 FE0F    00500      AND      0F0H        ;LOW BITS DON'T MATTER
7DF1 FE30    00510      CP      30H         ;30 IF READY
7DF3 C9      00520      RET              ;GO SEND CHARS
7DF4 3A4038  00530      LD      A,(3840B)      ;STROBE CNTRL KEYS
7DF7 CB57    00540      BIT      2,A         ;BREAK PRESSED?
7DF9 C27200  00550      JP      NZ,0072H     ;QUIT IF SO
7DFC 10BE    00560      JR      READY       ;CHECK AGAIN
00570 ;
00580          00530      END
00000 TOTAL ERRORS

```

Example

```

10 CLS
20 CLEAR200
30 DIM N1$(32),B$(8,8),N2$(16),G$(8,8),N3$(16)
40 DEFSTRN,Y:DEFINTA-M,0-X,Z
50 VI=15360:SC=0:IN=1:W=0
55 FORI=1TO8:FORJ=1TO8:B(I,J)=0:G(I,J)=0:NEXTJ,I
60 FORI=1TO32:N1(I)=RIGHT$(STR$(I),2):NEXT
70 FORI=1TO7:N2(I)=STRING$(2,CHR$(64+I)):NEXT:FORI=8TO16:N2(I)=STRING$(2,CHR$(65
+I)):NEXT
80 FORI=1TO8:N3(I)=STR$(I):NEXT:FORI=9TO16:N3(I)=CHR$(56+I)+" ":NEXT
85 IFTHEN110
90 CLS:PRINT:PRINT"BLACK BOX VERSION 2.0":PRINT"BY MORRIS JONES":PRINT:PRINT"DO
YOU NEED INSTRUCTIONS? ";
95 V=INKEY$:IFV=""THEN95
100 PRINTV$:FORI=1TO200:NEXT:IFY="Y"THENC=-1:GOTO8000:ELSEIFV<>"N"PRINTCHR$(68):
:GOTO95
110 C=0:CLS
500 FORUV=1TO8:FORHU=1TO8:D=VI+65+64*UV+3*HU:POKED,143:POKED+1,143:NEXTHU,UV
510 FORI=1TO8:PRINT@65+3*I,N1(I):NEXT
520 FORI=9TO16:PRINT@156+64*(I-9),N1(I):NEXT
530 FORI=17TO24:PRINT@665-3*(I-17),N1(I):NEXT
540 FORI=25TO32:PRINT@577-64*(I-25),N1(I):NEXT
550 PRINT@99,"CHOOSE:";:PRINT@163,"DEGREE OF DIFFICULTY,";:PRINT@227,"NUMBER OF
BALLS (3-5)?";
560 H=VAL(INKEY$):IFH<3ORH>5THEN560ELSEPRINT@250,H;
570 FORI=1TOH
580 HU=RND(8):UV=RND(8)
590 IFB<HU,UV>THEN580ELSEB<HU,UV>=-1:NEXT
600 FORI=1TO700:NEXT
610 GOSUB8410
620 PRINT@99,"CHOOSE:";:PRINT@163,"1) STOP AND SCORE";:PRINT@227,"2) LAUNCH RAY"
;:PRINT@291,"3) PLACE BALL GUESS";
630 PRINT@355,"4) REMOVE BALL GUESS";:PRINT@419,"5) REDRAW BOX";:PRINT@773,"POIN
TS USED:";:SC;
640 PRINT@803,STRING$(34," "):PRINT@803,"CHOICE?";
650 X0=VAL(INKEY$):IFX0<1ORX0>5THEN650ELSEPRINTX0:FORI=1TO200:NEXT
660 ONX0GOTO1000,2000,3000,4000,5000
1000 FORI=1TO8:FORJ=1TO8:IFG(I,J)THENW=W+1:NEXTJ,IELSENEXTJ,I
1010 IFW>HPRINT@803,"TOO MANY GUESSES";:W=0:FORI=1TO700:NEXT:GOTO610
1020 IFW<HPRINT@803,"NOT ENOUGH GUESSES";:W=0:FORI=1TO700:NEXT:GOTO610
1025 GOSUB8410:GI=-1

```

Program Listing 1

copy of Editor/Assembler to assemble the source code into machine language. If you are using a 16K machine, assemble the code with an origin of 7B00H (31488 decimal), for 32K try BB00H (-17664 decimal), and for 48K try FB00H (-1280 decimal).

If you use a Radio Shack interface to drive your printer then your task is almost over. Delete lines 250 through 270 and lines 2980 through 3600; Superlist will automatically use the printer routine in Level II. You may still wish to use a routine that will format your copy in pages. The Level II driver counts printed lines, but does not send a form feed or a set of line feeds when a page is full.

I used the Heathkit H-14 printer with Small System Software's popular RS-232 interface. If you have one of these insert their machine language after line 2980. At the beginning of Superlist, the program will



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change Basic's line printer Device Control Block to reflect this routine location. In fact, once you have run Superlist you can continue to use its printer driver routine to LLIST and LPRINT. I borrowed the RS-232 driver routine used by Electric Pencil to drive my H-14 and modified it to count lines and form feed after a full page. Pencil's driver is a bit shorter than the relocatable code provided by Small Systems.

If you use Radio Shack's RS-232 interface to drive your serial printer, use the source code provided by Radio Shack in the book included with the interface.

In each of these cases the printer driver can be assembled separately if there is not room in the Editor/Assembler buffer for the additional text. Use an

origin of 7DB4H. BUFF should be after the printer routine, so set it in the main source listing to the last address of the driver plus one byte. Try not to get carried away writing a long printer driver. BUFF should not end up above 7EC0H.

About Basic RAM

Before you can understand what Superlist is doing, you should know the format Basic uses to store its programs. This task would have been close to impossible were it not for Fuller Software's "Supermap" Level II ROM documentation. Although there seemed to be a few crucial things missing from the map, Fuller provided most of the information I needed.

The first line of any Basic program begins at 42E9H. The first two bytes of a line contain

the starting address of the next line (stored by Superlist in NXTLIN). This is followed by the line number (stored in binary as a two-byte unsigned integer) then the line of text ending with a zero byte.

The big problem becomes decoding the Basic keyword tokens. The ASCII for each keyword is stored in ROM; all of the keywords are stored back to back in a list beginning at 1650H. The ASCII keywords are stored in the numerical order of their tokens, starting with token 128. The beginning of each keyword is marked by setting the highest bit (bit seven) in the first byte, which is the same as adding 128 to the ASCII code for the letter. In order to locate the ASCII keyword corresponding to a particular token, the program subtracts 128 from the

token (by zeroing bit seven) and uses the remainder to count through the table. The count is decremented each time a new keyword is encountered (a byte with bit seven set) until the correct keyword is found.

Fuller referred to this subroutine in Level II ROM by saying "Call Mr. Spock for his opinion of this message," so I called my decoding routine "Spock." I had fun trying to find out how to decode the tokens, since the format of this table was one of the few things Fuller left out of "Supermap."

The surprises came after I had a working program to test. Basic stores an Else with a colon immediately before it. This had the desirable effect of breaking the line of text at each Else. But if the Basic programmer had already put a colon

```

10 CLS
20 CLEAR 200
30 DIM N1$(32),B$(8),N2$(16),G$(8),N3$(16)
40 DEFSTR N,V:
DEFINT A-M,O-X,Z
50 UI = 15360:
SC = 0:
IM = 1:
W = 0
55 FOR I = 1 TO 8:
FOR J = 1 TO 8:
B(I,J) = 0:
G(I,J) = 0:
NEXT J,I
60 FOR I = 1 TO 32:
N1(I) = RIGHT$(STR$(I),2):
NEXT
70 FOR I = 1 TO 7:
N2(I) = STRING$(2,CHR$(64+I)):
NEXT
FOR I = 8 TO 16:
N2(I) = STRING$(2,CHR$(65+I)):
NEXT
80 FOR I = 1 TO 8:
N3(I) = STR$(I):
NEXT
FOR I = 9 TO 16:
N3(I) = CHR$(56+I) + " ":
NEXT
85 IF C THEN 110
90 CLS:
PRINT:
PRINT "BLACK BOX VERSION 2.0":
PRINT "BY MORRIS JONES":
PRINT:
PRINT "DO YOU NEED INSTRUCTIONS? ":
95 Y = INKEY$:
IF Y = "" THEN 95
100 PRINT Y:
FOR I = 1 TO 200:
NEXT:
IF Y = "Y" THEN C = -1:
GOTO 8000:
ELSE IF Y < > "N" PRINT CHR$(88):
GOTO 95
110 C = 0:
CLS
500 FOR UU = 1 TO 8:
FOR HU = 1 TO 8:
D = UI + 65 + 64 * UU + 3 * HU:
POKE D,143:
POKE D + 1,143:
NEXT HU,UU
510 FOR I = 1 TO 8:
PRINT @65 + 3 * I,N1(I):
NEXT
520 FOR I = 9 TO 16:
PRINT @156 + 64 * (I - 9),N1(I):
NEXT
530 FOR I = 17 TO 24:
PRINT @665 - 3 * (I - 17),N1(I):
NEXT
540 FOR I = 25 TO 32:
PRINT @577 - 64 * (I - 25),N1(I):
NEXT
550 PRINT @99,"CHOOSE:";:
PRINT @163,"DEGREE OF DIFFICULTY,";:
PRINT @227,"NUMBER OF BALLS (3-5)?":
560 H = VAL (INKEY$):
IF H < 3 OR H > 5 THEN 560:
ELSE PRINT @250,H:
570 FOR I = 1 TO H
580 HU = RND (8):
UU = RND (8)
590 IF B(HU,UU) THEN 580:
ELSE B(HU,UU) = -1:
NEXT
600 FOR I = 1 TO 700:
NEXT
610 GOSUB 8410
620 PRINT @99,"CHOOSE:";:
PRINT @163,"1) STOP AND SCORE";:
PRINT @227,"2) LAUNCH RAY";:
PRINT @291,"3) PLACE BALL GUESS";:
630 PRINT @355,"4) REMOVE BALL GUESS";:
PRINT @419,"5) REDRAW BOARD";:
PRINT @773,"POINTS USED:";SC:
640 PRINT @803,STRING$(34," ");:
PRINT @883,"CHOICE?":
650 X0 = VAL (INKEY$):
IF X0 < 1 OR X0 > 5 THEN 650:
ELSE PRINT X0:
FOR I = 1 TO 200:
NEXT
660 ON X0 GOTO 1000,2000,3000,4000,5000
1000 FOR I = 1 TO 8:
FOR J = 1 TO 8:
IF G(I,J) THEN W = W + 1:
NEXT J,I
ELSE NEXT J,I
1010 IF W > H PRINT @803,"TOO MANY GUESSES":
W = 0:
FOR I = 1 TO 700:
NEXT:
GOTO 610
1020 IF W < H PRINT @803,"NOT ENOUGH GUESSES":
W = 0:
FOR I = 1 TO 700:
NEXT:
GOTO 610
1025 GOSUB 8410:
GI = -1
35 BASIC LINES IN PROGRAM
112 BASIC STATEMENTS IN PROGRAM
1348 BYTES USED BY PROGRAM TEXT

```

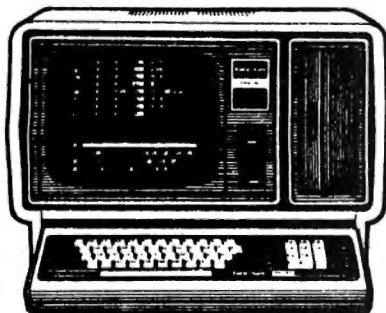
Program Listing 2

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before the Else I ended up with double colons, and a blank line of text. When Basic does a list to video, it suppresses the colon preceding an Else. I decided that was desirable, so Superlist looks only for the case of double colons and skips over one of them, so you won't produce a blank line. Let it be known you need never put

a colon before an Else. Basic will do it for you, and you will never see it unless you use Superlist.

The other surprise was the way Basic stores remark lines. An apostrophe is interchangeable with a REM statement, but Basic does not store them the same way. If you put the keyword REM in a line, Basic will

store REM as a one byte token. But if you put an apostrophe in a line Basic first stores a colon, then a REM token, then the apostrophe token. What looks like a one byte apostrophe actually takes three bytes of memory to store.

Superlist will look for an apostrophe token each time it encounters a REM token and

skip past the REM if there is an apostrophe.

If you wish for Superlist to suppress these Basic extras in the same fashion an ordinary list does, see the modifications below.

Superlist Routines

The only way to tackle any large programming problem is to break it down into a group of smaller problems. Superlist was written in this "block" fashion. Here are descriptions of the routines used by Superlist (keep the source listing handy as you read these):

•From the beginning to Start2 the program initializes the memory and variable space it will be using. Superlist can be left in high memory and used over and over. Each time it is restarted it must clear the various flags and counters, which is done by lines 150 through 230. Lines 240 through 290 initialize Basic's line printer Device Control Block at 4025H.

Start2 is the starting point

Program Listing 3

```

00100 ;SOURCE FILE FOR SUPERLIST. MEMSIZE=31487 /31488
00110 ;COPYRIGHT MORRIS JONES MAY 14, 1980
7800          00120      ORG      7800H
7800 ED73FE7F 00130      LD      (&7FFEH),SP      ;SAVE SP
7804 31FE7F   00140      LD      SP,7FFEH      ;NEW STACK
7807 DD21AD7D 00150      LD      IX,LINES      ;INDEX TO CLEAR VARS
7808 AF       00160      XOR      A
780C DD7780   00170      LD      (&IX),A      ;CLEAR LINES
780F DD7781   00180      LD      (&IX+1),A
7812 DD7782   00190      LD      (&IX+2),A      ;CLEAR STMTS
7815 DD7783   00200      LD      (&IX+3),A
7818 DD7784   00210      LD      (&IX+4),A      ;CLEAR QUOTES
781B DD7785   00220      LD      (&IX+5),A      ;CLEAR QUITFL
781E DD7786   00230      LD      (&IX+6),A      ;CLEAR CHARS
7821 DD212540 00240      LD      IX,4025H      ;PRINTER DCB
7825 21B47D   00250      LD      HL,PRINT3     ;USE 0580H FOR
7828 DD7781   00260      LD      (&IX+1),L      ; BASIC'S PRINTER
782B DD7782   00270      LD      (&IX+2),H      ; DRIVER.
782E DD368336 00280      LD      (&IX+3),54     ;# OF LINES
7832 DD368400 00290      LD      (&IX+4),0      ;LINE COUNTER
7836 FD21E942 00300      LD      IV,42E9H      ;INIT BASIC POINTER
783A FD22A87D 00310      LD      (&NXTLIN),IV ;STARTING POINT
783E FD2A8B7D 00320      LD      IV,&NXTLIN     ;NEW LINE START
7842 DD21157E 00330      LD      IX,BUFF      ;INIT OUTPUT BUFFER
7846 FD4E00   00340      LD      C,(IV)        ;NEXT LINE LSB
7849 FD23     00350      INC      IV
784B FD4600   00360      LD      B,(IV)        ;NEXT LINE MSB
784E FD23     00370      INC      IV

```

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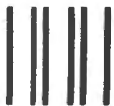
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Program continued

```

7B50 78 00380 LD A,B ;TO TEST
7B51 B1 00390 OR C ;FOR ZERO, END OF FILE
7B52 CA887D 00400 JP Z,QUIT ;QUIT IF SO
7B53 ED43A87D 00410 LD (NEXTLINE).BC ;SAVE IF NOT
7B59 FD6E00 00420 LD L,(IV) ;LOW BYTE LINE #
7B5C FD23 00430 INC IV
7B5E FD6600 00440 LD H,(IV) ;HIGH BYTE LINE #
7B61 FD23 00450 INC IV
7B63 AF 00460 XOR A ;CLEAR ACCUMULATOR
7B64 111027 00470 LD DE,10000 ;FIRST DIVISOR
7B67 C0C07E 00480 CALL SUBTR ;LEAVES DIGIT IN A
7B6A 11E803 00490 LD DE,1000 ;THOUSANDS DIGIT
7B6D C0C07E 00500 CALL SUBTR
7B70 116400 00510 LD DE,100 ;HUNDREDS DIGIT
7B73 C0C07E 00520 CALL SUBTR
7B76 116A00 00530 LD DE,10 ;TENS DIGIT
7B79 C0C07E 00540 CALL SUBTR
7B7C 7D 00550 LD A,L ;ONES DIGIT IS LEFT
7B7D C630 00560 ADD A,30H
7B7F D07700 00570 LD (IX),A
7B82 D023 00580 INC IX
7B84 3E20 00590 LD A,20H ;SPACE AFTER LINE #
7B86 D07700 00600 LD (IX),A ;SAVE IT
7B89 D023 00610 INC IX
7B8B FD7E00 00620 LD A,(IV) ;GET NEXT CHAR
7B8E FD23 00630 A2 INC IV ;INC BASIC PNTR
7B90 CB7F 00640 JR 7,A ;CHECK HIGH BIT
7B92 2B35 00650 JR Z,A3 ;GO IF NOT
7B94 FE93 00660 CP 93H ;CHECK FOR REM
7B96 281C 00670 JR NZ,A13 ;NO, GO TO ELSE CHECK
7B98 FD7E00 00680 LD A,(IV) ;LOOK AT NEXT FOR
7B9B FEFB 00690 CP 0F8H ;APOSTROPHE TOKEN
7B9D 2885 00700 JR Z,A14 ;YES, GO TO # CHECK
7B9F FD7EFF 00710 LD A,(IV-1) ;NO, GET BACK REM
7BA2 1820 00720 JR A15 ;GO TO SPOCK
7BA4 FD23 00730 A14 INC IV ;SKIP PAST REM IF
7BA6 FD7EFC 00740 LD A,(IV-4) ;LOOK BACK FOR #
7BA9 FE3A 00750 CP 3AH ;IN CASE OF 2 COLONS
7BAB 2002 00760 JR NZ,A16
7BAD D02B 00770 DEC IX ;WRITE OVER IT
7BAF FD7EFF 00780 A16 LD A,(IV-1) ;GET BACK APOSTROPHE
7BB2 1810 00790 JR A15 ;GO TO SPOCK
7BB4 FE95 00800 A13 CP 95H ;CHECK FOR 'ELSE'
7BB6 200C 00810 JR NZ,A15 ;LOOK FOR '#'
7BB8 FD7EFD 00820 LD A,(IV-3)
7BBB FE3A 00830 CP 3AH
7BBD 2002 00840 JR NZ,A17
7BBF D02B 00850 DEC IX ;YES, WRITE OVER SECOND #
7BC1 FD7EFF 00860 A17 LD A,(IV-1) ;GET BACK 'ELSE' TOKEN
7BC4 CDF07B 00870 A15 CALL SPOCK ;INTERPRET IF BIT7 SET
7BC7 18C2 00880 JR A2
7BC9 B7 00890 A3 OR A ;TEST FOR ZERO
7BCA 2009 00900 JR NZ,A4 ;GO FORWARD
7BCC D07700 00910 LD (IX),A ;SAVE THE ZERO
7BCF CD367C 00920 CALL PRINT1 ;PRINT THE LINE
7BD2 C33E7B 00930 JP START2 ;TRUCK ON
7BD5 D07700 00940 A4 LD (IX),A ;JUMP HERE IF
7BD8 D023 00950 INC IX ;ORDINARY ASCII
7BDA 19AF 00960 JR A2 ;GET ANOTHER UN
;
7BDC AF 00980 SUBTR XOR A ;CLEAR A
7BD0 ED52 00990 B1 SBC HL,DE ;SUBTRACT DE
7BD2 FAE57B 01000 JP M,C1 ;JUMP IF NEGATIVE
7BE2 3C 01010 INC A ;COUNT IF POSITIVE
7BE3 18F8 01020 JR B1
7BE5 B7 01030 C1 OR A ;TO RESET CARRY FLAG
7BE6 ED5A 01040 ADC HL,DE ;ADD THE DIVISOR BACK
7BE8 C630 01050 ADD A,30H ;CONVERT TO ASCII
7BEA D07700 01060 LD (IX),A
7BED D023 01070 INC IX
7BEF C9 01080 RET ;SAVE CHAR
;
7BF0 F5 01090 ; COUNT THROUGH
7BF1 D07EFF 01100 SPOCK PUSH AF ;SAVE CODED CHAR
7BF4 FE20 01120 LD A,(IX-1) ;LOOK BACK AND SEE
7BF6 2808 01130 CP 20H ;IF IT'S A SPACE
7BF8 FE3A 01140 JR Z,SP1 ;IF IT IS FORGET IT
7BFA 2807 01150 JR Z,SP1 ;OR IF IT'S A COLON
7BFC 3E20 01160 LD A,20H ;FORGET IT, TOO
7BFE D07700 01170 LD (IX),A ;BUT IF IT ISN'T
7C01 D023 01180 INC IX ;PUT ONE THER
7C03 F1 01190 SP1 POP AF ;GET BACK TOKEN
7C04 E67F 01200 AND 7FH ;WASTE THE HIGH BIT
7C06 47 01210 LD B,A ;MAKES IT A COUNTER
7C07 04 01220 INC B
7C08 215016 01230 LD HL,1650H ;TABLE START
7C09 7E 01240 SP2 LD A,(HL)
7C0C CB7F 01250 BIT 7,A ;CHECK THE HIGH BIT
7C0E 23 01260 INC HL ;MOVE AHEAD ANYWAY
7C0F 28FA 01270 JR Z,SP2 ;NO GOOD, GET ANOTHER
7C11 18F8 01280 DJNZ SP2 ;DEC COUNTER IF IT IS
7C13 2B 01290 DEC HL ;WE FOUND IT!
7C14 E67F 01300 AND 7FH ;AND IT'S IN A
7C16 D07700 01310 LD (IX),A ;STORE THE SUCKER
7C19 D023 01320 INC IX
7C1B 23 01330 SP3 INC HL ;LOOK AT THE
7C1C 7E 01340 LD A,(HL) ;NEXT ONE
7C1D CB7F 01350 BIT 7,A ;NEW WORD?
7C1F 2807 01360 JR NZ,SP4 ;YES, QUIT
7C21 D07700 01370 LD (IX),A ;NO, SAVE IT
7C24 D023 01380 INC IX
7C26 18F3 01390 JR SP3 ;GO LOOK AGAIN
7C28 FD7E00 01400 SP4 LD A,(IV) ;LOOK AT NEXT CHAR
7C2B FE20 01410 CP 20H ;FOR A SPACE
7C2D C8 01420 RET Z ;QUIT IF IT IS
7C2E 3E20 01430 LD A,20H ;ELSE
7C30 D07700 01440 LD (IX),A ;PUT ONE IN
7C33 D023 01450 INC IX
7C35 C9 01460 RET ;SPLIT
;
7C36 D021197E 01480 PRINT1 LD IX,BUFF ;RESET BUFFER PNTR
7C3A ED58A07D 01490 LD DE,(LINES) ;GET LINE COUNTER
7C3E 13 01500 INC DE ;ADD ONE
7C3F ED53A07D 01510 LD DE,(LINES),DE ;SAVE IT
7C43 ED58AF7D 01520 LD DE,(STMENTS) ;GET STATEMENTS COUNT
7C47 13 01530 INC DE ;ADD ONE
7C48 ED53AF7D 01540 LD DE,(STMENTS),DE ;SAVE IT
7C4C C0DF7C 01550 CALL INDCNT ;SET LEFT MARGIN
7C4F D04E00 01560 A11 LD C,(IX) ;GET FIRST CHARACTER
7C52 D023 01570 INC IX ;POINT TO NEXT

```

Program continues

for each new line of Basic text read by Superlist. It begins by reading the address of the next line of program and storing it. Then it reads the two-byte line number. Converting this number into decimal digits is a matter of dividing the line number by 10000 to get the first digit, dividing the remainder by 1000 for the next digit and so on. The line number is stored in HL, the divisor in DE. Upon returning from SUBTR (described below) the ASCII digit has been stored in the output buffer, and the remainder is left in HL.

Each character of the Basic line is then put through a series of tests in lines 620 through 960. If bit seven of the character is set, then it is a Basic token. If not, it is merely placed in the output buffer as an ASCII character. A zero byte indicates the end of a line, and the program calls Print1 to print the buffer and goes back to Start2 to set the next line. If the character is a Basic token, it is tested to see if it is an Else or a REM. In the case of an Else, it checks to see if it was preceded by two colons and deletes one from the listing. If the token is a REM followed by an apostrophe, it deletes the REM. The program also looks for two colons preceding the REM and deletes one of those. After testing, the token is sent to Spock for decoding.

*SUBTR is the division routine for the line number. DE contains the divisor and HL the dividend. Each time DE can be subtracted from HL with a positive result, register A is incremented. When the subtraction produces a negative result, DE is added back to HL. Register A then contains the quotient and HL the remainder. Adding 30H to A converts it into an ASCII digit which is then stored in the output buffer.

Upon encountering a Basic token, the program calls Spock. One of the aims of Superlist is to spread out the compacted lines. Spock does this by checking for a space before and after the keyword and putting in spaces if they don't exist. To decode the token, the high bit is

set to zero by ANDing the A register with 7FH. The number remaining is how far down the table you must look to find the keyword. (For instance, after zeroing bit seven, if 34 is left, the word is 34th in the list.)

•Print1 is called after a complete line of Basic has been interpreted, spread out and stored in the output buffer. First the counters for lines and statements are incremented, then the program looks at the first characters of the line number. In order to prevent leading zeros from being printed, the routine substitutes a space for a zero until a non-zero character is encountered.

Print1 also looks for colons and if it encounters one, increments the statement counter, prints a carriage return and indents six spaces. However, if the colon is enclosed in quotation marks as part of a string constant, we do not wish to split the line. Quotes is a flag set when the routine encounters a quotation mark. If Quotes is set, the colon check is skipped and reset if Print1 encounters a zero byte signifying the end of the line.

Subroutines

The program drops into four levels of subroutines before printing a character.

•The main routine calls Print1 when the output buffer is ready to be printed. Print1 calls Print2 each time a character is ready to be printed.

•Print2 counts the characters to provide a right margin before finally calling Print. If a line is full, Print2 sends a carriage return and indents 11 spaces before continuing. If the character sent to Print2 is a carriage return, Print2 resets the character counter.

•Indent is optional. It merely prints eight spaces to provide a left margin.

•Print begins by checking to see if you are pressing Break and jumps to Quit if you are. Print is written as if the location of the printer routine is unknown. Index register IX is loaded with the start address of Basic's line printer Device Control Block which contains the

Program continued

```

7C34 79 01580 LD A,C ;TEST FOR ASCII ZERO
7C35 FE30 01590 CP 30H
7C37 2000 01600 JR NZ,A12 ;OUTPUT LINE IF OK
7C39 0E20 01610 LD C,20H ;SEND A SPACE IF NOT
7C3B CDAD7C 01620 CALL PRINT2
7C3E 18EF 01630 JR A11 ;GO GET NEXT ONE
7C60 D04E00 01640 A6 LD C,(IX) ;GET FIRST CHR
7C63 D023 01650 INC IX ;POINT TO NEXT ONE
7C65 79 01660 LD A,C ;TO TEST IT
7C66 FE22 01670 A12 CP 22H ; FOR QUOTES
7C68 2007 01680 NZ,A5 ;NO, GO AHEAD
7C6A 3AB17D 01690 LD A,(QUOTES) ;YES,
7C6D 2F 01700 CPL ;CHANGE THE FLAG
7C6E 32B17D 01710 LD A,(QUOTES),A ;WELL IT WASN'T THERE
7C71 3AB17D 01720 A5 LD A,(QUOTES) ; IF WE JUMPED HERE
7C74 B7 01730 OR A ;GET BACK CHAR
7C75 79 01740 LD A,C ;IF FLAG SKIP COLON TEST
7C76 2004 01750 JR NZ,A7 ;CHECK FOR COLON
7C78 FE3A 01760 CP 3AH ;YES, GO FORWARD
7C7A 2812 01770 JR Z,A8 ;NO, TEST FOR ZERO
7C7D B7 01780 A7 OR A ;NO, JUMP TO PRINT
7C7F 200A 01790 JR NZ,A10
7C80 32B17D 01810 LD (QUOTES),A ;CLEAR QUOTES FLAG
7C83 0E8D 01820 LD C,0DH ;YES, SEND
7C85 CDAD7C 01830 CALL PRINT2 ; A CR LF
7C88 C9 01840 RET
7C89 CDAD7C 01850 A10 CALL PRINT2 ;PRINT THE CHAR IF(<X>
7C8C 18D2 01860 JR A6 ;GET MORE CHARACTERS
7C8E ED5BAF7D 01870 A8 LD DE,(STMENTS) ;HERE IF COLON
7C92 13 01880 INC DE ;ADD ONE TO
7C93 ED53AF7D 01890 LD (STMENTS),DE ; STATEMENT COUNTER
7C97 CDAD7C 01900 CALL PRINT2 ;PRINT THE COLON
7C9A 0E8D 01910 LD C,0DH ;AND SEND
7C9C CDAD7C 01920 CALL PRINT2 ;A CR LF
7C9F CD0F7C 01930 CALL INDENT ;SET LEFT MARGIN
7CA2 0606 01940 LD B,6 ;COUNT SIX
7CA4 0E20 01950 LD C,20H ; SPACES
7CA6 CDAD7C 01960 A9 CALL PRINT2 ;AND SEND
7CA9 18FB 01970 DJNZ A9 ; EACH ONE
7CAB 18B3 01980 JR A6 ;GET MORE CHARS
7C9D 79 01990 ; PRINT2 LD A,C ;ROUTINE TO COUNT CHARS
7CAE FE8D 02010 CP 0DH ;TEST FOR CR
7CB0 2825 02020 JR Z,P1 ;GO CLEAR AND SEND
7CB2 3AB37D 02030 LD A,(CHARS) ;GET CHAR COUNTER
7CB5 3C 02040 INC A ;ADD ONE
7CB6 32B37D 02050 LD (CHARS),A ;SAVE IT
7CB9 FE41 02060 CP 65 ;65 IS FULL LINE
7CBB 201E 02070 JR NZ,P2 ;PRINT IT IF NOT 65 VET
7CBD C3 02080 PUSH BC ;SAVE THE CHAR
7CBE 0E8D 02090 LD C,0DH ;LOAD A CR
7CC0 CDEB7C 02100 CALL PRINT ;AND SEND IT
7CC3 CD0F7C 02110 CALL INDENT ;LEFT MARGIN
7CC6 3E8C 02120 LD A,12 ;RESET CHARS
7CC8 32B37D 02130 LD (CHARS),A ;TO INDENTED VALUE
7CCB 0606 02140 LD B,11 ;FOR ELEVEN SPACES
7CCD 0E20 02150 LD C,20H ;SPACE ASCII
7CCF CDEB7C 02160 P3 CALL PRINT ;PRINT A SPACE
7CD2 18FB 02170 DJNZ P3 ;ELEVEN TIMES
7CD4 C1 02180 POP BC ;GET BACK CHAR
7CD5 1804 02190 JR P2 ;GO PRINT IT
7CD7 AF 02200 P1 XOR A ;CLEAR CHARS
7CD8 32B37D 02210 LD (CHARS),A
7CD9 CDEB7C 02220 P2 CALL PRINT
7CDE C9 02230 RET ;BACK TO PRINT1
7CDF C3 02240 ; INDENT PUSH BC
7CE0 0606 02250 LD B,6 ;INDENT FOR LEFT MARGIN
7CE2 0E20 02260 LD C,20H ;SPACE
7CE4 CDEB7C 02280 IND1 CALL PRINT
7CE7 18FB 02290 DJNZ IND1
7CE9 C1 02300 POP BC
7CEA C9 02310 RET
7CEB E3 02320 ; PRINT PUSH HL
7CEC D0E5 02340 PUSH IX
7CEE 214038 02350 LD HL,3840H ;LOOK AT BREAK KEY
7CF1 C856 02360 BIT 2,(HL)
7CF3 0823 02370 JR NZ,Q2 ;QUIT IF PRESSED
7CF5 D0212540 02380 JR IX,4025H ;PRINTER DCB GOES IN IX
7CF9 21847D 02390 LD HL,PRTRTRET
7CFC E3 02400 PUSH HL
7CFD D06E01 02410 LD L,(IX+1) ;PUSH RETURN ADDRESS
7D00 D06682 02420 LD H,(IX+2) ;WE DO THIS SINCE
7D03 E9 02430 JP (HL) ; WE CAN'T CALL(HL)
7D04 D0E1 02440 PRTRTRET POP IX ;RETURN HERE AND GET
7D06 E1 02450 POP HL ; BACK RES
7D07 C9 02460 RET
7D08 3AB27D 02480 QUIT LD A,(QUITFL) ;GET FLAG
7D0B B7 02490 OR A ;TEST IT
7D0C 2811 02500 JR Z,Q1 ;IF IT'S NOT SET GO UP
7D0E 3E80 02510 LD A,0 ;CLEAR IT IF IT IS
7D10 32B27D 02520 LD (QUITFL),A
7D13 0E8C 02530 LD C,12 ;FORM FEED
7D15 CDEB7C 02540 CALL PRINT
7D18 ED78FE7F 02550 Q2 LD SP,(7FEH) ;RESTORE STACK
7D1C C37200 02560 JP 72H ;AND GO BACK TO BASIC
7D1F ED48AD7D 02570 Q1 LD BC,(LINES) ;PUT LINES
7D23 ED43517D 02580 LD (M2A),BC ;IN MESSAGE
7D27 ED48AF7D 02590 LD BC,(STMENTS) ;PUT STATEMENTS
7D28 ED436C7D 02600 LD (MSA),BC ;IN MESSAGE
7D2F FDE5 02610 PUSH IY ;END OF BASIC
7D31 E1 02620 POP HL ;INTO HL
7D32 11E942 02630 LD DE,42E9H ;START OF BASIC
7D35 B7 02640 OR A ;CLEAR CARRY
7D36 ED52 02650 SBC HL,DE ;GET THE DIFFERENCE
7D38 228C7D 02660 LD (M4A),HL ;PUT IN MESSAGE
7D3B 014A7D 02670 LD BC,M1 ;GET LINE ADDRESS
7D3E ED43AB7D 02680 LD (NKTLIN),BC ;AND PUT IN NKTLIN
7D42 3E3F 02690 LD A,0FFH ;TO SET QUIT FLAG
7D44 32B27D 02700 LD (QUITFL),A
7D47 C33E78 02710 JP START2 ;GO PRINT IT!
7D4A 4F7D 02720 ; DEFW M2
7D4C 0000 02740 M1A DEFW 0
7D4E 00 02750 DEFW 0
7D4F 6A7D 02760 M2 DEFW M3
7D51 0000 02770 M2A DEFW 0
7D53 42 02780 DEFH 'BASIC LINES IN PROGRAM'

```

Program continues

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Program continued

```

7D54 41
7D55 53
7D56 49
7D57 43
7D58 28
7D59 4C
7D5A 49
7D5B 4E
7D5C 45
7D5D 53
7D5E 28
7D5F 49
7D60 4E
7D61 28
7D62 58
7D63 52
7D64 4F
7D65 47
7D66 52
7D67 41
7D68 4D
7D69 08
7D6A 8A7D 02798 DEFB 0
7D6B 0000 02800 M3 DEFW M4
7D6C 0000 02818 M3A DEFW 0
7D6E 42 02820 DEFM 'BASIC STATEMENTS IN PROGRAM'
7D6F 41
7D70 53
7D71 49
7D72 43
7D73 28
7D74 53
7D75 54
7D76 41
7D77 54
7D78 45
7D79 4D
7D7A 45
7D7B 4E
7D7C 54
7D7D 53
7D7E 28
7D7F 49
7D80 4E
7D81 28
7D82 58
7D83 52
7D84 4F
7D85 47
7D86 52
7D87 41
7D88 4D
7D89 08
7D8A 897D 02838 DEFB 0
7D8B 0000 02840 M4 DEFW M3
7D8C 0000 02850 M4A DEFW 0
    
```

Program continues

address of the printer driver, and this address can be loaded into HL. The driver routine ends with a RET, but there is no Z80 instruction to Call (HL). When the RET is executed it will pop a return address from the stack; the program must put the return address in the stack by PUSHing it before loading the routine address in HL and jumping to it.

When the main routine encounters 0000 as the NXTLIN address, Superlist has reached the end of the Basic program and jumps to the Quit routine.

The messages that tell how big the program is must still be taken care of. To print these messages I decided to set up a block of memory with the same format as Basic RAM. The lines and statements have been counted and saved in LINES and STMNTS. These are two-byte unsigned integers, just like the line numbers of Basic. Quit stores these numbers where the line numbers would appear in Basic. When the program

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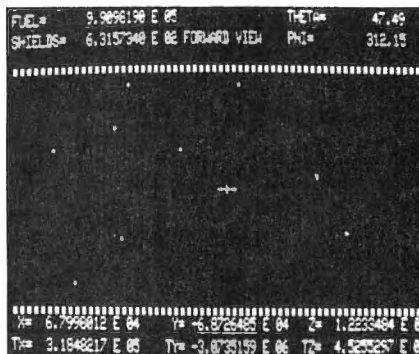
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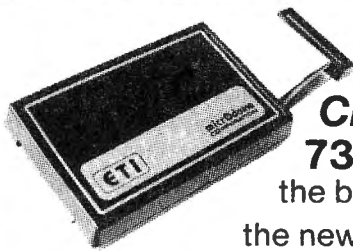
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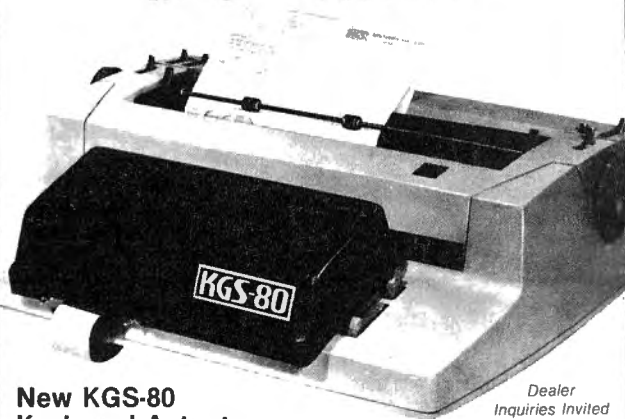
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7DBF 59
7D90 54
7D91 45
7D92 53
7D93 20
7D94 55
7D95 53
7D96 45
7D97 44
7D98 20
7D99 42
7D9A 59
7D9B 20
7D9C 50
7D9D 52
7D9E 4F
7D9F 47
7DA0 52
7DA1 41
7DA2 40
7DA3 20
7DA4 54
7DA5 45
7DA6 58
7DA7 54
7DA8 00      02870      DEFB  0
7DA9 0000    02880      DEFW  0
7DAB 0000    02890      NXTLIN DEFW  0
7DAD 0000    02900      LINES  DEFW  0
7DAF 0000    02910      STMTS  DEFW  0
7DB1 00      02920      QUOTES DEFB  0
7DB2 00      02930      QUITFL DEFB  0
7DB3 00      02940      CHARS  DEFB  0
          02950      ;
          02960      ;   INSERT YOUR PRINTER ROUTINE HERE
          02970      ;
7DB4      02980      PRINT3 EQU  $
          02990      *LIST OFF          ;PROTECT TRS232 DRIVER
          03600      *LIST ON
7E19      03610      BUFF  EQU  $
7E00      03620      END    7B00H
00000 TOTAL ERRORS

DELAY 7E13
OUT    7E0E
OUT0   7E0C
PR1    7DF8
OUT1   7E0B
PRINT4 7DEF
ST4    7DDF
ST3    7DE9
ST2    7DC8

```

Program continues

reaches Quit the last address of the Basic program is in IY. The start of Basic is subtracted from this address to set the length of the program in bytes, and this number is stored with the last message. Quit then sets a flag (Quitfl), stores the start of the message block in NXTLIN and jumps back to Start2. The program decodes the text and prints it just as if it were Basic. The next time control goes to Quit and the flag has been set, Quit prints a form feed, restores the stack pointer and jumps back to Basic.

Modifications

Superlist can be customized to suit whatever needs or desires you may have for Basic listings.

The left margin of the listing is set by the Indent routine. To change the left margin, change the value in line 2260. If you want no left margin, leave out the Indent routine and delete the calls to Indent in lines 1550, 1930 and 2110.

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The Assembler features all of the following: complete 6809 instruction set; complete 6800 set supported for cross-assembly; conditional assembly; local labels; assembly to cassette tape or to memory; listing to screen or printer; and mnemonic error codes instead of numbers.

The versatile ABUG monitor is a compact version of CBUG, tailored for debugging programs generated by the Assembler and Editor. It features examine/change of memory or registers, cassette load and save, breakpoints and more. **SDS80C Price: \$89.95**



CRACK THOSE ROMS!



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MONITOR ROM: The same program as above, supplied in 2716 EPROM. This allows you to use the entire RAM space. And you don't need to re-load the monitor each time you use it. The EPROM plugs into the Extended Basic ROM Socket or a modified ROMPACK. **CBUG ROM Price: \$39.95**

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The total line length is set in line 2060 to 65 characters. You can change this value to whatever right margin you prefer.

Line 280 initializes the printer Device Control Block for 54 lines per page. If you want more or less, change that value. You must have a printer routine that keeps track of the line count to get paged output.

If you do not wish the automatic colon before Else statements, delete lines 820-840 and 860. To suppress the automatic colon before an apostrophe remark statement, delete lines 740-760 and 780.

Superlist was written before the recent changes in Level II Basic. The only changes affecting Superlist are the start of Basic program storage and the possible relocation of the token look-up table. I understand a new edition of "Supermap" includes all the changes to Level II. "Supermap" is available from Fuller Software, Grand Prairie, TX, or your local computer store. ■

Program continued

```

ST1      7DB6
M5       7D99
M4       7DBA
M3       7D6A
M1A      7D4C
M2       7D4F
M1       7D4A
M4A      7D6C
M3A      7D6C
M2A      7D51
Q1       7D1F
QUITFL   7DB2
PRTRT    7D04
Q2       7D18
IND1     7CE4
P3       7CDF
PRINT    7CEB
P2       7CDB
CHRS     7DB3
P1       7CD7
A9       7C96
A10      7CB9
A8       7C8E
A7       7C7C
QUOTES   7DB1
A5       7C71
A6       7C68
PRINT2   7C9D
A12     7C56
A11     7C4F
INDENT   7CDF
STNTS    7D9F
SP4      7C28
SP3      7C1B
SP2      7C08
SP1      7C03
C1       7BES
B1       7BDD
PRINT1   7C36
A4       7BDS
SPOCK    7BF0
A17     7BC1
A16     7BAF
A15     7BC4
A14     7BA4
A13     7BA4
A3       7BC9
A2       7B88
SUBTR    7B8C
QUIT     7D08
BLUFF    7E19
START2   7B3E
MXTLIN   7DAB
PRINT3   7DB4
LINES    7D9D

```



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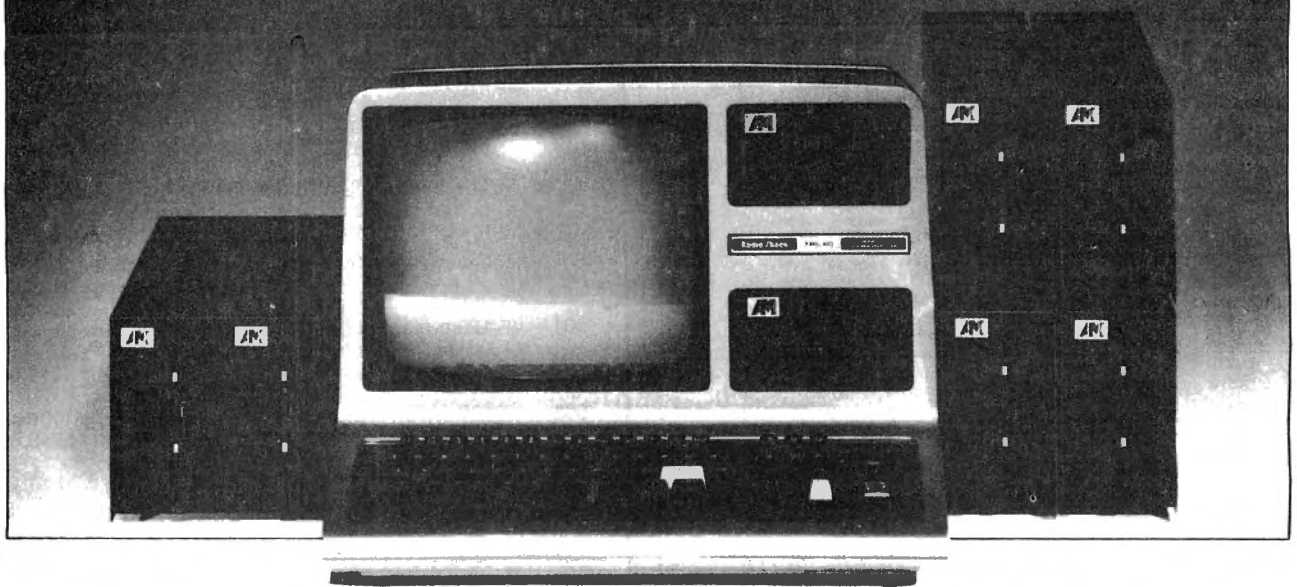
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If necessary, A.M. Electronics, Inc. can modify both the program and hardware to allow on-line storage of an unlimited amount of items. As the file becomes larger, maintenance operations take longer. Average search time is six seconds, with 12 seconds the longest time.

Upon program initialization, the user specifies the item number and description digit length. This allows for item numbers up to 23 alpha-numeric characters. (As item number digits increase, digits for description usage are decreased.)

The program is completely menu-driven. Items can be added, edited, or deleted from the file. Items can be placed on order, received to stock, or sold from inventory. Complete printout capabilities are available.

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Since one facet of my job is to screen vendor-submitted components for compliance with specifications established for current parts in usage, it seemed desirable to let the computer do the preliminary screening. Op-amp is a program I wrote that allows me to compare 14 selected parameters between a currently used part and one being submitted as a possible second source. The program was originally written for use on an INTEL MDS230 and later adapted to my TRS-80.

The Parts File

There are actually two parts to this program. The first is used to create a file named Parts containing the specifications of known and used parts. The second is to compare the part under consideration with a known part in the previously created Parts file.

The Parts file is created as a sequential access file under VTOS 4.0. One feature of VTOS 4.0 is an enhancement to Disk

Basic which allows a sequential file to be opened and positioned to its end. New data can then be added without the necessity of reading the entire file into an array in memory, adding the new data to the array and then rewriting the file. Non-VTOS users will have to modify the program for this type of operation.

The Evaluation

The evaluation function of the program is straight forward. The program first queries for the known op-amp in the Parts file to be used as the standard of comparison. It then asks for parameter information about the part under consideration and, after all information has been entered, lists any specifications that compare unfavorably. A printout or display on your video of all the parameters point by point can be obtained.

One thing to remember when entering parameter information is to avoid using typical data. Instead, use a bad example for the parameter being evaluated.

The fourteen parameters considered by the program are listed below:

- **Power Supply Voltage:** Most op-amps operate from equal voltages of opposite polarity. The value to be used here is the maximum allowable power supply voltage of either polarity referenced to zero volts.

- **Differential Input Voltage:** The maximum allowable difference in input voltage between the two op-amp input terminals.

- **Input Voltage:** Maximum allowable input voltage of either polarity that can be applied to

an input with the other held to zero volts.

- **Input Offset Voltage:** The voltage that must be applied to the inputs to achieve a zero output voltage. This generally indicates how closely matched the inputs are. The lower this value, the better.

- **Input Offset Current:** The difference in input bias currents which causes a voltage difference across the input resistors. If this value is large, unacceptable input voltages can be generated.

- **Input Bias Current:** Average of the two input bias currents which cause voltage drop across the input resistors that must be overcome to the input signal.

- **Input Noise Voltage:** A measure of internally generated noise at the inputs of the op-amp.

- **Differential Input Resistance:** The impedance seen by a source looking into the inputs of the op-amp. This figure is used when matching the op-amp to driving device. A mismatch will cause excessive loss of input signal.

- **Common Mode Rejection Ratio:** This indicates how well balanced the differential stages of the op-amp are.

- **Large Signal Voltage Gain:**

The ratio of the change in output voltage to a change in input voltage measured without feedback or compensation. This figure is frequency-dependent.

- **Output Voltage Swing:** Peak voltage output that can be obtained without clipping. This is measured with reference to zero volts.

- **Slew Rate:** The maximum rate of change of output voltage with respect to time that can be obtained while maintaining linearity.

- **Power Supply Rejection Ratio:** A measure of sensitivity to changes in power supply voltage and noise on power supply lines.

- **Power Dissipation:** The maximum power the device can safely dissipate at a given temperature and under specified conditions of power supply voltage and load.

Most op-amp data sheets list other parameters but these 14 were chosen for their overall importance to device operation. Once a preliminary screening of these parameters has been done, a closer look can be given the part if warranted. In any event this program can be a real aid in finding new sources of replacement parts. ■

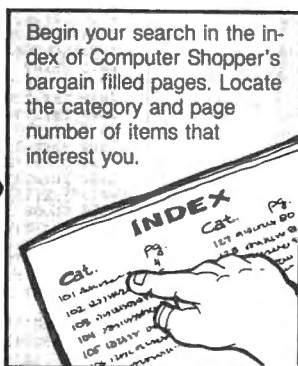
Program Listing

```
10 CLS
20 CLEAR500:DIM A(16),K(16),U(16),SS(16),US(16)
21 FORK=1TO16:READ$(X):NEXTX
22 DATA "VOLTS"," ","VOLTS","VOLTS","MICROVOLTS","NANOAMPS","NANOAMPS","MICROVOLTS","MEGOHMS"," ","DB","V/MV","VOLTS","V/MICROSE
COND","DB","MW"
25 FORK=1TO16:READ$(X):NEXTX
```

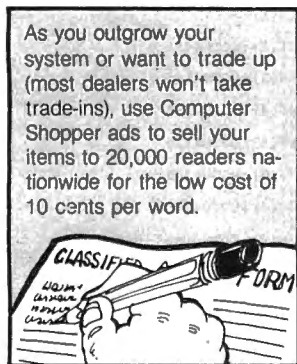
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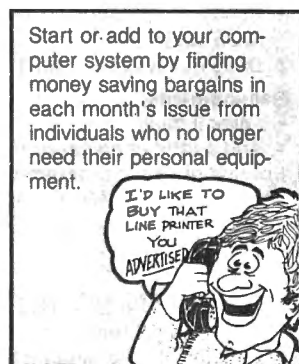


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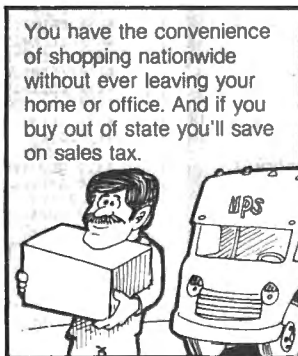
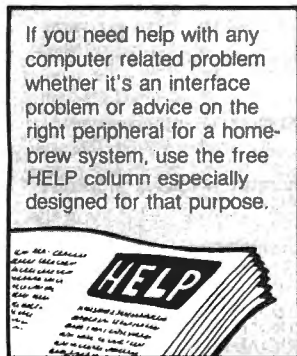
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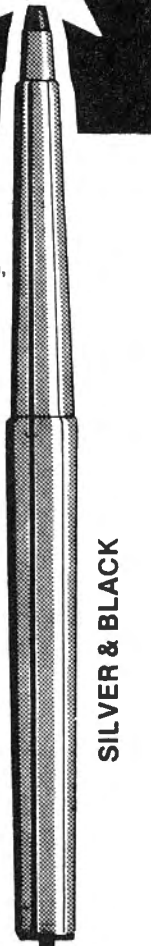
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City _____ St. _____ Pen Basic
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Zip _____

Card # _____ Money
Ex. _____ CK. Order Visa MC
Date _____



SILVER & BLACK

Program continued

```

26 DATA "POWER SUPPLY VOLTAGE", " ", "DIFFERENTIAL INPUT VOLTAGE",
"INPUT VOLTAGE", "INPUT OFFSET VOLTAGE", "INPUT OFFSET CURRENT", "I
NPUT BIAS CURRENT", "INPUT NOISE VOLTAGE", "DIFFERENTIAL INPUT RES
ISTANCE"
27 DATA "COMMON MODE REJECTION RATIO", "LARGE SIGNAL VOLTAGE GAIN
", "OUTPUT VOLTAGE SWING", "SLEW RATE", "POWER SUPPLY REJECTION RAT
IO", "POWER DISSIPATION"
30 PRINTTAB(15); "OPERATIONAL AMPLIFIER EVALUATION":PRINT
40 PRINT"THIS PROGRAM CREATES AND UPDATES AN OP-AMP DATA FILE NA
MED":PRINT"PARTS". THIS FILE PROVIDES A DATA BASE FOR PARAMET
ER":PRINT"COMPARISONS WHICH WILL DETERMINE COMPONENT INTERCHAGEA
BILITY.":PRINT
70 INPUT"OPTIONS (1) PARTS FILE UPDATE (2) EVALUATE A PART (3) Q
UIT":A
80 IFA<10RA>3THENPRINT:GOTO70
90 ONAGOTO2000,4000,5000
2000 CLS:PRINT:PRINT"PARTS FILE UPDATE. ENTER SPECIFICATIONS AS
REQUESTED.":PRINT"IF UNABLE TO DETERMINE A VALUE, ENTER 0."
2005 PRINT
2010 INPUT"WHAT IS THE PART ID ";FS
2011 ONERRORGOTO2015:OPEN "I",#1,"PARTS"
2012 INPUT#1,A$,K(1),K(2),K(3),K(4),K(5),K(6),K(7),K(8),K(9),K(1
0),K(11),K(12),K(13),K(14),K(15),K(16):IFFS=A$THENPRINT:PRINTFS;
" IS ALREADY IN THE PARTS FILE.":PRINT:CLOSE 1:GOTO70:ELSEIFPROP(
1)THENCLOSE1:GOTO2015:ELSE2012
2015 PRINT
2020 FORX=1TO16
2030 IFX=2ORX=10GOTO2050
2040 PRINTS$(X); " (";U$(X);") ";:INPUTA(X)
2050 NEXTX
2100 FORX=1TO16:K(X)=A(X):NEXTX
2190 OPEN "E",#1,"PARTS"
2200 PRINT#1,FS; " ";K(1);K(2);K(3);K(4);K(5);K(6);K(7);K(8);K(9)
;K(10);K(11);K(12);K(13);K(14);K(15);K(16)
2210 CLOSE 1
2220 PRINT:PRINT"PARTS FILE HAS BEEN UPDATED TO INCLUDE ";FS
2230 PRINT:GOTO70
2240 PRINT"DISK ERROR - RESTART NECESSARY":RESUME70
4000 CLS:PRINT:PRINT"OP-AMP COMPONENT EVALUATION."
4010 PRINT:INPUT"WHICH OP-AMP DO YOU WISH TO EVALUATE AGAINST";A
$
4020 OPEN "I",#1,"PARTS"
4030 INPUT#1,FS,K(1),K(2),K(3),K(4),K(5),K(6),K(7),K(8),K(9),K(1
0),K(11),K(12),K(13),K(14),K(15),K(16)
4031 IFA$=F$THEN4038
4032 IF EOF(1)THEN4034ELSEGOTO4030
4034 CLOSE 1:PRINT:PRINT"UNABLE TO FIND ";A$;. TRY AGAIN. ":PRI
NT:GOTO70
4038 CLOSE 1
4040 PRINT:PRINT"ENTER THE SPECS OF THE OP-AMP BEING EVALUATED A
S REQUESTED."
4045 PRINT:INPUT"WHAT IS THE ID OF THE OP-AMP BEING EVALUATED ";
X$
4050 FORX=1TO16
4055 IFX=2ORX=10GOTO4065
4060 PRINTS$(X); " (";U$(X);") ";:INPUTU(X)
4065 NEXTX:PRINT
4075 IFK(1)=0THENPRINT"NO DATA FOR ";S$(1):GOTO4095
4080 IFU(1)<K(1)THENPRINT"FAILS ";S$(1)
4095 IFK(3)=0THENPRINT"NO DATA FOR ";S$(3):GOTO4105
4100 IFU(3)<K(3)THENPRINT"FAILS ";S$(3)
4105 IFK(4)=0THENPRINT"NO DATA FOR ";S$(4):GOTO4115
4110 IFU(4)<K(4)THENPRINT"FAILS ";S$(4)
4115 IFK(5)=0THENPRINT"NO DATA FOR ";S$(5):GOTO4125
4120 IFU(5)>K(5)THENPRINT"FAILS ";S$(5)
4125 IFK(6)=0THENPRINT"NO DATA FOR ";S$(6):GOTO4135
4130 IFU(6)>K(6)THENPRINT"FAILS ";S$(6)
4135 IFK(7)=0THENPRINT"NO DATA FOR ";S$(7):GOTO4145
4140 IFU(7)>K(7)THENPRINT"FAILS ";S$(7)
4145 IFK(8)=0THENPRINT"NO DATA FOR ";S$(8):GOTO4155
4150 IFU(8)>K(8)THENPRINT"FAILS ";S$(8)
4155 IFK(9)=0THENPRINT"NO DATA FOR ";S$(9):GOTO4175
4160 IFU(9)<K(9)THENPRINT"FAILS ";S$(9)
4175 IFK(11)=0THENPRINT"NO DATA FOR ";S$(11):GOTO4185
4180 IFU(11)<K(11)THENPRINT"FAILS ";S$(11)
4185 IFK(12)=0THENPRINT"NO DATA FOR ";S$(12):GOTO4195
4190 IFU(12)<K(12)THENPRINT"FAILS ";S$(12)
4195 IFK(13)=0THENPRINT"NO DATA FOR ";S$(13):GOTO4205
4200 IFU(13)<K(13)THENPRINT"FAILS ";S$(13)
4205 IFK(14)=0THENPRINT"NO DATA FOR ";S$(14):GOTO4215
4210 IFU(14)<K(14)THENPRINT"FAILS ";S$(14)
4215 IFK(15)=0THENPRINT"NO DATA FOR ";S$(15):GOTO4225
4220 IFU(15)<K(15)THENPRINT"FAILS ";S$(15)
4225 IFK(16)=0THENPRINT"NO DATA FOR ";S$(16):GOTO4235
4230 IFU(16)<K(16)THENPRINT"FAILS ";S$(16)
4235 PRINT:PRINT"EVALUATION COMPLETED. DISCREPANCIES AS NOTED."
4240 INPUT"DO YOU WANT A COMPARISON PRINTOUT (Y/N) ";A$
4250 IFA$="N"GOTO4310
4260 IFA$<"Y"THEN4240
4261 PRINT:INPUT"DO YOU WANT THE PRINTOUT ON (1) VIDEO (2) PRINT
ER":A:IFA=1THEN4265ELSE4320
4265 PRINT"PARAMETER";:PRINTTAB(30);FS;:PRINTTAB(39);X$;:PRINTTA
B(50);"UNITS"
4270 FORX=1TO16
4280 IFX=2ORX=10GOTO4300
4290 PRINTS$(X);:PRINTTAB(31);K(X);:PRINTTAB(38);U(X);:PRINTTAB(
48);U$(X)
4300 NEXTX
4310 GOTO70
4320 A=PEEK(14312):IFA>128THEN4380ELSELPRINT"PARAMETER";:LPRINTT
AB(39);FS;:LPRINTTAB(39);X$;:LPRINTTAB(50);"UNITS"
4330 FORX=1TO16
4340 IFX=2ORX=10GOTO4360
4350 LPRINTS$(X);:LPRINTTAB(31);K(X);:LPRINTTAB(38);U(X);:LPRINT
TAB(48);U$(X)
4360 NEXTX
4370 GOTO70
4380 INPUT"PRINTER NOT READY. ABORT? (Y/N)";A$:IFA$<"N"THEN4390
ELSEINPUT"READY PRINTER AND PRESS <ENTER>";A$:GOTO4320
4390 INPUT"PRINT TO VIDEO INSTEAD (Y/N)";A$:IFA$="Y"THEN4265ELSE
70
5000 CLS:END

```

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...of things that go bump in your keyboard.

Keyboard Incantations

Allen V. Robnett
Gallatin High School
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Ghost stories are usually just for thrills, but here's one which offers insights, too. A good ghost story depends on setting the scene, and this scene requires a TRS-80 keyboard.

So sit ye down, and turn the lamp down low.

The incantation must be carried out exactly or the spell will not work. Certain keys must be held down while others are struck. The held keys are indicated by a numeral below the key name. The number indicates which finger must be used for everything to come out right. The little finger of the left hand is numbered 1, and the little finger of the right hand, 10. An asterisk means the key is not to be held.

As the warlock of the story, I will make intermittent utterances. You must not release any held key until instructed to do so.

The spell involves keyboard-video I/O, so do this:

I	O	Space
(8)	(9)	(*)

Hmmm. Very strange. Maybe you ought to do that again. This time don't release the keys.

Let's take a bit from machine language

and make a CD call to the wizard of Halloween:

C	D	H	Space
(3)	(2)	(7)	(*)

Don't let go! That's creepy—a syntax error and you never came close to the Enter key.

Don't turn back now. Strike:

T	Q
(*)	(*)

Release your right hand (I,O, and H) and press onward:

O	O	L	T
(*)	(*)	(*)	(*)

How's that for spelling?

Release and clear everything. We'll try a few more.

When you and your keyboard play a duet, you should let it do more of the work. Press (In succession) and hold: D U T

See what I mean? What's behind this mystery? Clear again and release. We'll ask the keyboard.

Press and hold the letters: C L U S

OK, release and relax.

Breaking the Spell

Of course, the parlor tricks we've done here are just for fun, but they reveal something about the way the keyboard works. Multiple key presses can be useful. Shifted characters are a good example, as are the 123, DFG, or JKL commands used in some well-known utilities.

Many sources refer to addresses 3800H through 3BFFH (14336 through 15359) as keyboard memory. Maybe it should be called pseudo memory. The first byte of the address (38, 39, 3A, or 3B) simply connects the keyboard output lines to the microprocessor. The second byte of the address, which ranges between 00 and FF, selects the key row to be read. For discussion or scanning purposes, the keys are arranged in an 8 x 8 matrix (or map) as shown in Fig. 1. It is convenient to call one matrix index R (for row) and the other C (for column). This description reflects the electrical connections but is not related to the physical rows of the keyboard.

Each key is simply a switch which, when pressed, will connect its row conductor to its column conductor. Each row is addressed by one bit of the low byte of the memory address. Hence, 3801H has bit 0 set (2⁰ = 1), and thus addresses row 0.

The row addresses, are as given in Fig. 2.

In scanning the keyboard for input, ROM simply addresses each row in turn, thereby sending a signal to the row, and looks to see which column (if any) is activated. The eight columns become the eight bits of the output data byte. When a single key is pressed, the data byte will have only one bit set. The decimal value of the byte must be either 1,2,4,8,16,32,64, or 128 (decimal). It is a simple matter for ROM to figure out which

	C0	C1	C2	C3	C4	C5	C6	C7
R0	@	A	B	C	D	E	F	G
R1	H	I	J	K	L	M	N	O
R2	P	Q	R	S	T	U	V	W
R3	X	Y	Z					
R4	0	1	2	3	4	5	6	7
R5	8	9	:	;	,	-	.	/
R6	ENT	CLR	BRK	↑	↓	←	→	SPC
R7	SHIFT							

Fig. 1 Keyboard Matrix

Keyboard Row	Keyboard Address	
	Hex	Decimal
0	3801	14337
1	3802	14338
2	3804	14340
3	3808	14344
4	3810	14352
5	3820	14368
6	3840	14400
7	3880	14464

Fig. 2. Keyboard Memory Addresses

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"This bit of magic served as an incentive."

key it was. You try it.

Suppose you PEEK(3804H) and get a reply of 8 (decimal). Which key was being held down at the time? Address 3804H means ROM read row 2 ($2^2 = 4$). Data byte 8 ($= 2^3$) means the column of the key was three which makes the key "S".

So much for single key presses. Now try an experiment. Type in PRINT PEEK(14337), but before hitting Enter, press and hold A and B simultaneously while you backspace twice and enter (still holding "AB"). Why does the computer respond 6? Did it add the 2 for A to the 4 for B? Not exactly; it OR'd them.

	0000010	2
OR	0000100	4
Yields	0000110	6

Isn't that the same as adding? No, look at:

	0000010	2
OR	0000110	6
Yields	0000110	6

For our present purpose since each key in a row sets only one bit in the data byte, the effect will be the same as adding. If the row 0 data byte is 6 (for AB), how does ROM know it is supposed to print either A or B?

Glad you asked. ROM uses seven memory locations (4036H through 403CH) to store the data byte for each of the rows except the last (which contains only Shift). With each scan of the keyboard, the new byte for each row is compared with the byte from the previous scan. No action is taken if they are the same. If they are different, the previous byte is masked out and the result is output.

Note that Shift is treated differently since there is no reason to separate it from keys pressed simultaneously. But that's another story.

If you really manage to press the two keys close enough in time for ROM to see the events as simultaneous, then ROM will not be able to strip the extra code properly. It will happily take the lower of the bits remaining after the attempt.

Letter Substitutions

This still doesn't explain the weird letter substitutions or what happened to the addresses in between 3801H, 3802H, 3804H, 3808H, and so forth. The missing addresses represent combinations of rows, which might conceivably be useful if you wanted to use some exotic password or command.

The substitution sleight of hand stems from a sneak path in the electronic circuit. If you hold keys from a given column but in different rows, all of the columns activated in any row appear to be activated in all the involved rows.

For example, if you own a utility that is activated by holding 123, try holding ABC2 instead. It works. Looking at Fig. 1 you can see that ABC1 or ABC3 would have worked just as well. Believe it or not, even "Clear/Break/↑" do the job.

A set of keys in one row defines the columns involved, and one more key links the rows together. Now you see why "↑0 Space" clears the screen. 1 and 0 activate columns C1 and C7. Space makes sure that when row 6 is scanned, it too appears to have C1 and C7 activated.

ROM knows the previous data byte for row 6 was 00, so it doesn't strip anything. It is quite content to take the lower of the two activated columns, which (for row 6) is Clear.

More Mysteries

This bit of magic served as an incentive to wend our way through the keyboard mechanism. It gives some insight into how wizards use multiple key codes, and it provides a little Halloween fun.

If you are interested in PEEKing at the keyboard memory, you must arrange it so that Enter is not the last key hit. Program Listing 1 will do this, formatting the display in lines 16-bytes wide and identifying the first address of each line.

You must press a key and hold it while the display is printing, or press several keys together.

If you are curious about the remainder of the keyboard memory (3900H through 3BFFH), insert lines

```
35 For K=1 TO 4: PRINT
105 NEXT K
```

You will find that the next three pages are identical to the first page. They exist only because of a shortcut in the row-addressing scheme.

If you are intrigued by the ROM mechanism in stripping off previously held keys, try disassembling 03E3H through 03F9H in ROM. It's only 23 bytes.

Ask your computer what turns it on. Hold down in this order: I F M N Space 0. ■

```
10 DEFINT A-Z
20 K$=INKEY$:IF K$="" THEN 20
30 M=14336:I=M:N=14351
40 FOR J=1 TO 16:PRINT
50 PRINT I;
60 FOR I=M TO N
70 PRINT PEEK(I);
80 NEXT I
100 M=M+16:N=N+16
110 NEXT J
120 GOTO 20
```

Program Listing. Active Keyboard Display

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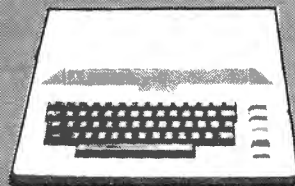
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Purezzap

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Just as there are monitor programs available for cassette users, there are several monitors that allow the disk user to analyze and modify programs on disk.

Two disk-based monitors that come to mind are Superzap by Aparat, and Purezzap by Computer Consultants.

Superzap is loaded and run under Disk Basic, and some of its functions are slowed by dependence upon the Basic interpretive process. This in no way detracts from the technical accuracy and wide capabilities of Superzap.

Purezzap is a machine language program that takes much less time to bring up, and its overall operation seems to be smoother because of the smaller time lags encountered.

For the one-drive owner, the entire program should be initially loaded into RAM so that a program of interest on another disk can be manipulated by inserting that disk into the same single drive.

The monitor program should allow the user to specify any desired track and sector location to be examined, instead of always starting at track 0, sector 0 for all functions. This will save a lot of wear and tear on both the disk drive mechanism and the user's patience.

The monitor should also permit examination of an entire sector at a time, with a pleasing and functional format displayed on the video screen. Cursor control should be versatile so that a particular byte displayed can be specifically designated for modification as necessary.

The user should be able to step the drive (and display) in either direction from the current sector location to an adjacent sector without returning to a menu and re-entering a whole string of commands and options. This saves considerable time in examining the many sectors storing a lengthy program.

Since we might also be interested in making minor changes to Basic programs on disk, an ASCII-equivalent dump of the 256 hexadecimal bytes in the sector display is of great help in locating specific program elements.

This ASCII display assists in analyzing and locating certain subroutines in a lengthy machine language program because many complicated programs use ASCII phrases for menu and error message displays.

We want to not only transfer disk data to the screen (and RAM), but also have the capability of modifying specific bytes and writing the modified sector back to exactly the same disk location from where the sector data was read out. There would be no point otherwise in attempting to modify bytes in a sector.

Purezzap

Purezzap comes on a formatted disk which contains only the monitor program itself, a directory track and a boot. No DOS is on the disk; you must transfer Purezzap to a disk containing at least a minimal disk operating system. The monitor program is furnished in this fashion to protect the copyrights of others regarding DOS programs.

The documentation furnished with Purezzap consists of a single page that explains the functions of the commands and options included in the menu displayed on the monitor screen.

When Purezzap is loaded from disk, it takes control of the computer. That disk may then be removed to make room for the disk to be examined. This makes it nice for those of us who have only one drive. The program is fully capable of functioning

with two drives, however, with the active drive designated by the user.

When the program is brought up, a comprehensive menu is displayed. You can then choose any of several options such as reading a sector from disk, comparing two designated sectors, purifying the directory, zeroing unallocated sectors, killing all system files to derive a formatted disk, computing hash codes, or jumping from Purezzap back to DOS.

Read and Write

Several choices from the master menu will bring up sub-menus that get down to specifics in configuring program operations to arrive at desired results. For instance, pressing the R key (Read Disk Sector) will replace the master menu with a smaller menu asking you to specify the drive, track and sector to be dumped from disk into memory and be displayed on the video monitor screen.

After the Read function has been completed, the full 256 bytes of the specified sector will be displayed in 16 lines of 16 bytes each. The ASCII equivalent of each hex byte in that line will be to the right of each line.

Along the left side of the screen you will see the current drive, track and sector numbers. Also displayed is the relative byte number corresponding to the current cursor location.

In addition, you will see a non-destructive cursor blinking at the zero relative byte in the current sector. You will also see a blinking cursor in the ASCII equivalent segment of the display. As the main cursor is moved around on the screen, the ASCII cursor is also moved to the corresponding relative location.

Let's say that you have examined the dump of this sector and see the byte that you wish to change. Simply use the arrow keys on the keyboard to position the cursor over that byte. Then press the M (Modify) key. The size of the cursor will change, indicating that Purezzap is now in

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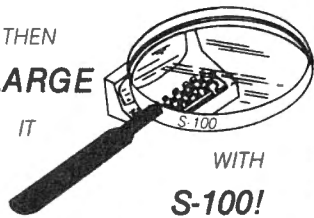
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"You can get in trouble very fast by zapping bytes on a disk without knowing what you are doing."

the Modify mode.

Type in your desired byte value at the current cursor position. The byte display at the current cursor location will change as you enter the new value. If this is the only change to be made to data in this sector, press W (Write).

Another sub-menu will now appear, offering you, among other things, the option of writing the edited sector back to disk. This intermediate step reduces errors in writing a modified sector to disk because you must request a Write operation on two separate occasions before that operation will actually occur.

While still in the Read mode, you can use the Search command to locate the byte you want. Simply type S, followed by the byte value you are looking for. If that byte is displayed, the cursor will be automatically placed directly over it.

To search the remainder of the sector for that same byte value, hit the S key again. The cursor will then indicate the next occurrence of the byte. When the search function turns up no further locations for that byte, the cursor will automatically return to the zero-relative byte location.

Directory Cleanup

Purifying the directory consists of zeroing out all killed directory entries. This makes it easier to find the entry data for the program of interest.

Zeroing unallocated sectors is helpful for transferring programs back and forth between locations on one or two disks in the modification process. You usually end up with the same sector data in two or more locations on the same disk, but the data in only one sector is valid. The other sector data is still accessible by the monitor because only the directory entry is modified when a kill is made; the sector data itself is unchanged.

This can be misleading to the unwary because, if Purezzap is used to hunt all over the disk for sector data, you have a good chance of seizing upon a dead sector. The data in that sector looks just as you expect it to, so you go to great lengths to modify it.

After that sector is written back to disk and the main program is run again, it will appear that your modifications were unsuccessful. This minor tragedy can be alleviated if all unused sectors on that disk were zeroed.

Hash code computation is a mystery to most disk zappers, but it is necessary to derive or verify the proper hash code when reconstructing the directory for a clobbered file. This code is based on the values of the hex numbers representing the file

name in a given directory entry, and it is stored in a specific position in the Hit table in the directory.

The hash code is a pointer to both the location and validity of a specific entry in one of the following sectors in the directory track. If the code is improper or missing, the computer will not be able to find the file you request it to load. Purezzap will generate and display the proper hash code for any filespec you type in.

Other Functions

Sector comparison using Purezzap is also very useful, especially when you are using two drives to reconstruct damaged sectors. This function still works just fine using one drive, though, because you can specify the drive, track and sector numbers for the comparison operation.

This is initiated by Reading the specified sector as before. Then the C key is pressed, bringing up another sub-menu. At this point you designate the exact location of the sector to be compared with the one just displayed. The data from the second sector is loaded into memory, and the comparison starts.

The relative byte number of the first occurrence of a byte value difference between the two sectors being compared is displayed, along with the values of those two bytes in their respective sectors. Hitting the C key again will continue the comparison until the next difference is encountered.

The kill function in Purezzap will change a system diskette to a formatted data diskette by killing all system files such as the SYSx/SYS, Basic and Format programs that are usually on a full DOS disk. The directory track and the boot sector are still available for use. Unchanged are all user programs and files present at the time of kill.

Pressing J will jump from the Purezzap master menu to the DOS currently in the computer, returning you to the DOS Ready prompt.

Return from any function of Purezzap back to the master menu is done simply by typing X. This is not only for recovery from an incorrectly entered command or parameter, but returns you to familiar ground in case you and the program get into foreign territory.

Further Thoughts

If you don't already realize it, you can get in trouble very fast by zapping bytes on a disk without having at least a general idea of what you are doing. A publication of immense value to the neophyte is Harv Pennington's *TRS-80 Disk and Other Mysteries*. ■

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Say, disk users, here's a sexy sector inspector.

Simplezap

David Safford
887 Linda Lee Circle
Lemoore, CA 93245

This simple Basic program allows direct sector input, examination, modification and output. To understand how the program works, you need some elementary disk theory.

A floppy disk is organized into 35 concentric tracks, and each track is divided into 10 sectors. Each sector contains a header which tells which track and sector it is, followed by 256 bytes of data. Any DOS must have routines that read and write these 256 byte sectors directly. The higher level DOS functions take these physical records and translate them to logical records or files as necessary.

All current Model 1 versions of TRSDOS locate these routines on memory page 4600-46FF (hex). Memory page 4600H is loaded from track 0 sector 7 during bootstrap, which is why any change must be made to this critical sector. Page 4600H contains all the

subroutines to select a disk and start its motor, seek the required track, then read or write a specified sector. In assembly language, accessing these routines is extremely easy. The format is:

C = Drive # (00-03 H)
D = Track # (00-23 H)
E = Sector # (00-09 H)

HL→256 byte RAM buffer
CALL 46DD for read sector to buffer
CALL 46E8 for write sector from buffer

My Basic program simply POKes the machine language routine into memory, calls it with the USR function, and then calls Debug to examine and modify the sectors in memory. After returning to Basic from Debug, the program can use the machine language routine to write the sector back to disk.

How to Use It

• It is not necessary to reserve memory for the buffer—the program uses so little memory that judicious selection of the buffer address (i.e., 7500H-7A00H) will keep it clear of the Basic program and the processor stack even in a 16K machine.

• The program first prompts for the 256-byte buffer address. The program will always locate the buffer at the start of a page address; if you input 8180H, the

buffer will actually be located at 8100H. This allows Debug to display the entire sector as one full page of memory.

• The "Drive, Track, Sector" prompt asks for decimal inputs—drive (0-4), track (0-35), sector (0-9). Once entered, the computer loads the sector to the buffer location and calls Debug.

• After examining and modifying the sector with standard Debug commands, type "G" (enter) to return to Basic.

• The program will then ask if you want to write the buffer contents to disk. Entering "E" will stop the program and return to Command Level Basic. This is the only way to exit since the break key will only execute Debug. Entering "Y" will write the sector; any other track sector prompt. Any entry other than "Y" will jump the program back

to the drive, track, sector prompt without writing the sector.

• Once the program and Debug have been called into memory, any disk can be substituted in drive 0 for examination or modification as long as they are formatted. Therefore, even single drive systems can use the program to restore bad directories or otherwise defective disks. The only irreparable defect is one in which the disk interface chip cannot find or read the sector header. If the interface cannot positively identify the requested sector by its header, it will lock up.

This program makes sector I/O on a TRSDOS system easy. Since the program is in Basic, modifications are relatively simple to make. ■

```
10 DATA 14,0,22,0,30,0,33,0,126,195,221,70
20 H$="0123456789ABCDEF"
30 CLS:PRINT"SECTOR I/O PROGRAM"
40 INPUT"ENTER BUFFER LOCATION (HEX)";A$
50 A=0:FOR I=1 TO 16:FOR J=1 TO 4
60 IF MID$(A$,J,I) = MID$(H$,I,I) THEN A=A+(I-1)*16+(4-J)
70 NEXT J:NEXT I:A=INT(A+.5):C=INT(A/256+.5):IFA>32767 THEN A=A-6553
6
80 FOR I=0 TO 11:READ B:POKE(A+256+I),B:NEXT I
90 DEFUSR1=A+256:POKEA+264,C
100 CLS:INPUT"ENTER DRIVE (0-4), TRACK (0-34), SECTOR (0-9)";D,T,S
110 POKEA+257,D:POKEA+259,T:POKEA+261,S
120 PRINTUSR1(0):CLS
130 CMD"D"
140 CLS:"INPUT"OUTPUT UPDATED SECTOR(Y/N/E)";A$="E" THEN STOP
150 IFA$<>"Y" THEN 100 ELSE IF T=17 THEN I=239 ELSE I=230
160 POKEA+266,I:PRINTUSR1(0):CLS:POKEA+266,221:GOTO 100
```

Program Listing

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Jim Heid
80 Microcomputing
May 1981, p. 30

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This mod rolls 16K of RAM over your ROM operating system.

ROM Roll-Over

Geary Kelch
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If you are concerned with machine-language programming or would like to add 16K or Random Access Memory to your TRS-80 without buying an expansion interface, you should be interested in this hardware modification. It is straightforward, inexpensive, and takes less than eight hours to build and debug. And it may give you a new perspective on your TRS-80's basic operating system, whether you have a Level I or a Level II machine.

By adding four chips and a 16K bank of 4116 chips whose address can be externally relocated anywhere in memory, you can replace your TRS-80's ROM with more versatile RAM memory. With this modification you can overlay the TRS-80's ROM operating system with your modified version, or with a totally rewritten one contained in the Random Access Memory.

The existing ROM is taken out of the circuit when this overlay is performed, and system control passes to the program contained in the added 16K memory block. Then you are able to dynamically change or replace part or all of the TRS-80's ROM-driven operating system.

Let me explain how this operation works. First, the TRS-80 has its operating system and Basic interpreter in Read Only Memory occupying the lowest memory addresses. The Level I takes up the first 4K of memory space from address 0000 to 0FFF (hex). Since this is ROM-type memory, its contents are unchangeable. The same is true for the Level II system, except it occupies the first 12K or memory address range 0000 to 2FFF(hex). This modification can replace the inflexible Read Only Memory with the preferable Random Access Memory. The simplified logic diagram in Fig. 1 shows how the chip select circuit can make this change. The circuit involves

two 7400 chips, one 7406, one 7442, a single-pole-single-throw switch, and a bank of eight 4116 RAM chips, at a cost of less than \$40.

The rest of the circuit is used to generate two chip select signals—one for low memory (0000-3FFF), the other for high memory. The high memory address can be any of three remaining 16K blocks, but the circuit shown in Fig. 3 is addressing locations 8000-BFFF (hex) as high memory. Also, since the entire layout can be wired in the keyboard, it is not necessary to have an expansion box. That is what makes it a great way to add an extra 16K to your machine at about the cost of the memory chips alone. You will, however, void any warranty on the system.

The trick to making this change easily is in adding the eight memory chips to the circuit with as few lines as possible. It can be done by soldering the new 4116 chips pin-for-pin directly to the existing memory, piggyback style as in

Fig. 2. This should be done using a low-power iron and soldering only a few pins at a time. The memory chips must be removed from the sockets before any soldering is started. Pin 15 of the upper chip in the pair should not be soldered to the corresponding pin of the lower chip, since this input will be used as the chip select for the 16K bank. These pins will be connected to the chip select logic generated by the four gates comprising the rest of the circuit. Once all the memory pairs have been soldered, with the exception of each pin 15, they can be replaced in the sockets. Make sure they are in the proper orientation.

The chip select circuitry that will feed pin 15 of the added chips is shown in Fig. 3. The pins used are noted, but if you have a Transistor-transistor Logic handbook, you may want to change the wiring slightly to make it easier for yourself. The logic, however, is in its simplest form and the gate count cannot be reduced. Location of the

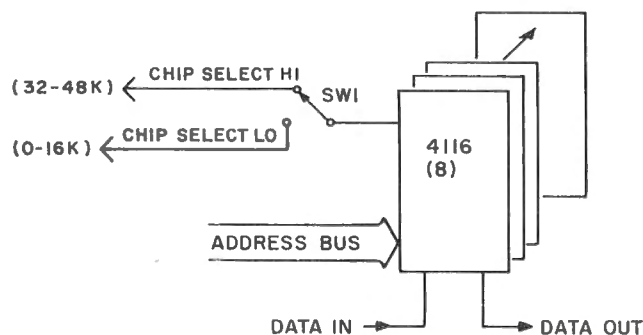


Fig. 1. Chip select circuitry for relocatable 16K bank of memory. Switch SW1 selects one of two chip select signals determining the address of the RAM memory block.

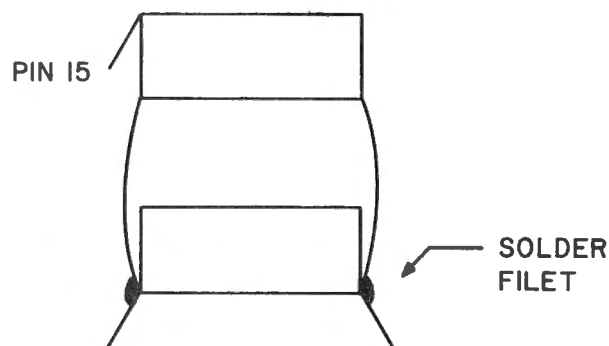
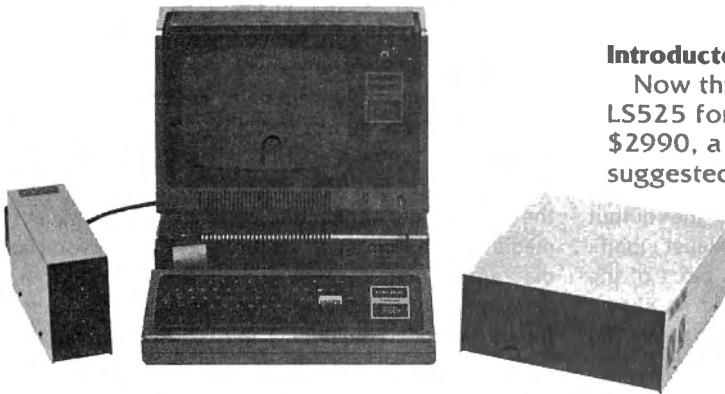


Fig. 2. Pin 15 used for chip select of upper bank, bent away from others to avoid shorting to pin 15 of lower chip.

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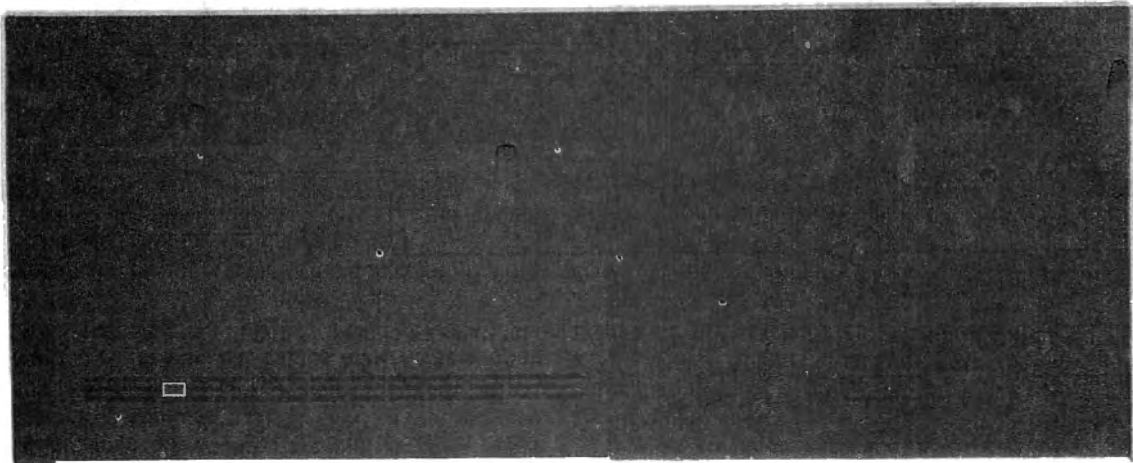
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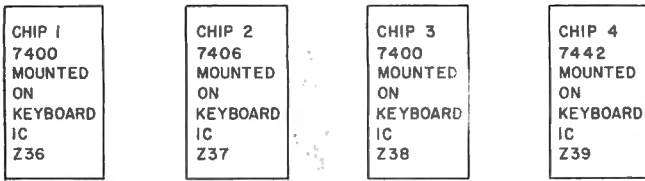


Fig. 3. By mounting the 74s on the back of integrated circuits Z36->Z39, wiring complexity and lead length will be kept to a minimum.

chips and the method of wiring them is up to you. In my system everything was done as simply as possible to keep cost and lead length down. By inverting the chips and mounting them upside down on the backs of Z36-Z39 as shown in Fig. 4, your leads may be soldered directly to the integrated circuit pins. Mounting the chips in the position minimizes lead length and eliminates crossing wires which helps to keep down noise. If desired, a small circuit board may be mounted to hold the four integrated circuits.

Trouble Shooting

To make trouble-shooting

easier, there are a few functions of the circuit that should be discussed in detail. The first deals with the memory address selection. As mentioned before, the add-on memory may be switched from a low to a high address via an external switch, SW1. The 7442 gate does the address decoding enabling chip selection. It is a 4-in-10-out binary decoder. By running A14 and A15 of the TRS-80 address bus to its two LSB inputs, you get 16K bank select signals at the output pins. The output's least significant bit, which is pin 1 of the chip, must be used as shown because it is used to select the

RAM when it is in the low position. However, any of the other three chip select signals (pins 2, 3 or 4) may be used to select RAM when SW1 is in the high position. Pin 2 of the 7442 would cause position 4000-7FFF to be used. Pin 3 selects addresses 8000-BFFF and pin 4 places the memory block at the top of storage or addresses C000-FFFF in hex. In the example, pin 3 was used, since it does not interfere with the existing memory in a 16K machine, and is contiguous with the original 16K. If your memory size is not the same you may want to move the add on memory address up or down. A 4-position rotary switch in the place of SW1 would enable you to move the address anywhere on a 16K boundary by running all four select lines out to the externally mounted switch.

There is another function of the chip select logic not immediately apparent in the diagram. This involves the deselection of a 4K block at the top of the added memory. This

deselection takes place when the memory is located at address 0000-3FFF (when the switch is in the low position). The deselection is accomplished by ANDing A12, A13 and CS Lo. When A12 and A13 are both high and CS Lo is active, a blocking of the chip select signal occurs. This is to prevent the processor from accessing the address range 3000-3FFF of the add-on memory when it is occupying low memory. Hence, the effective range is the first 12K (the range of Level II ROMs), rather than the full 16K block. It is necessary to block the upper 4K selection from 3000-3FFF since this is the area used by the video display and the keyboard input. This chip select blocking is not implemented when SW1 is in the high position; therefore the full 16K range is accessible in the upper addresses. Finally, be sure the jumper from pin 5 of Z74 to five volts is in place. This activates the memory Data In buffers for addresses above 7FFF. Without this jumper, you

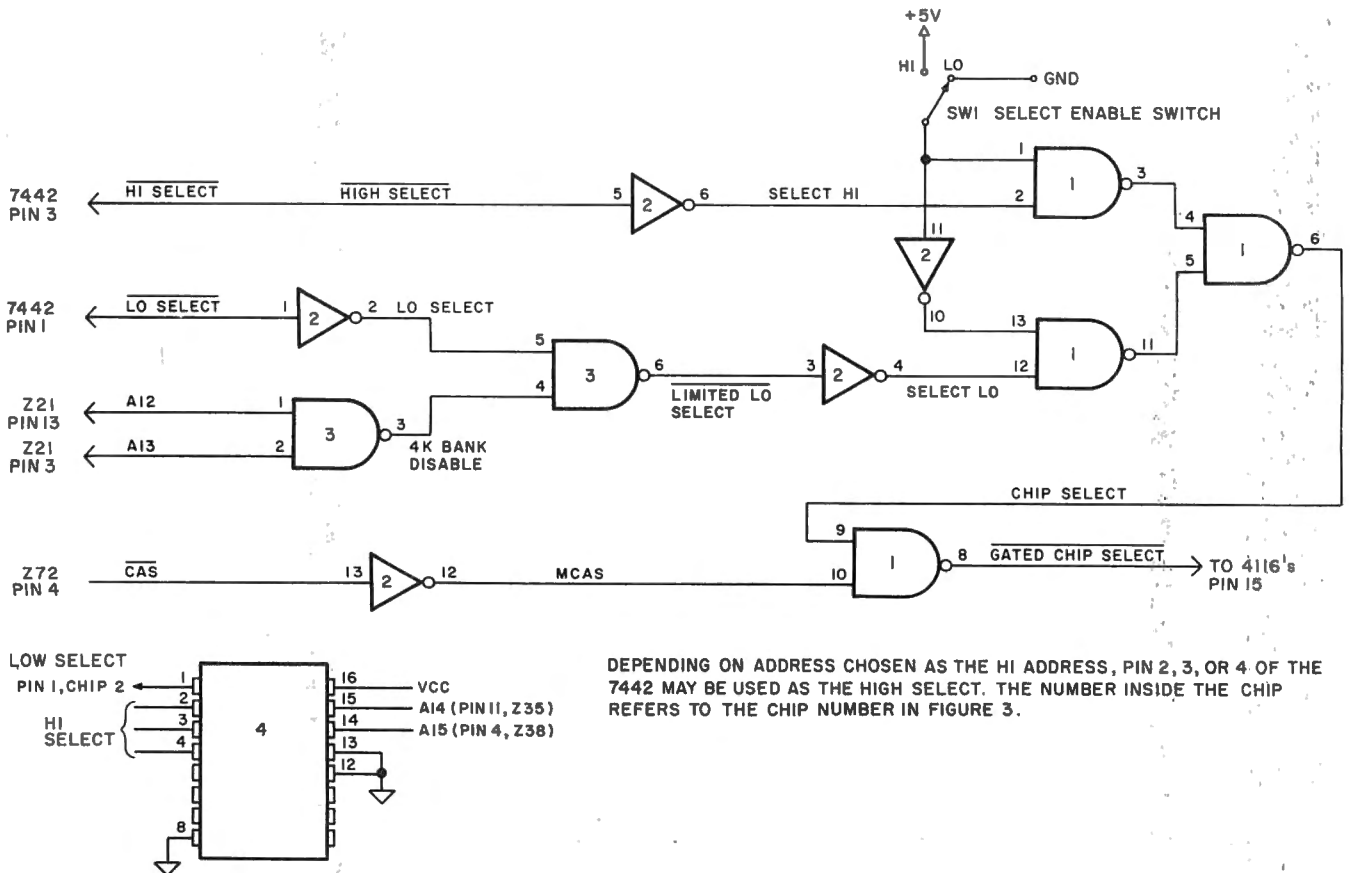


Fig. 4. Depending on what address is chosen as the HI address pin, two, three or four of the 7442 may be chosen as the high select. The number inside the chip refers to the chip number in Fig. 3.

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cannot read memory above the first 16K of useable RAM.

There is a short procedure to bring the system up for testing. With SW1 in the high RAM position, switch on the keyboard. The normal power on system response should be apparent. If there is no response, hit the Reset key. If there still is no correct response, toggle SW1 and try again. If this fails in resetting the system, there is an error in the chip-select circuit.

Address	Data
7000	21
7001	00
7002	80
7003	01
7004	00
7005	00
7006	0A
7007	77
7008	23
7009	03
700A	3E
700B	10
700C	B8
700D	CA
700E	91
700F	40
7010	C3
7011	06
7012	70

Table 1

Once the circuit is functioning, the T-Bug program or some other monitor routine allowing the writing of a machine-language loop must be loaded. When the prompt appears, manually load the program listed in Table 1, using the M verb of T-Bug. This short machine loop does a block memory move. It copies the contents of ROM into the added 16K RAM. If you are not using memory address 8000-BFFF as your high RAM position, addresses 7001 and 7002 of the program must be changed to reflect the starting address of the relocatable RAM (the least significant byte in address 7001 and the most significant byte in 7002). When the transfer is completed, control will pass back to T-Bug. Using the M verb again, examine locations 8000 to BFFF randomly to determine if the transfer has been made. What should appear is a copy of the ROM data starting at address 8000. Check this by comparing data at Oxyz to data at 8xyz. The data should

be the same. In general, data at address Axyz should be the same as data at address Axyz + 8000 for the range of 0-2. Once this has been verified, switch SW1 to the low RAM position. Your operating system is now in place. Again, with the M verb, try altering location 0000 in memory to 00(hex). If this works, you have verified that the RAM resident operating system has replaced the ROM. You now have the ability to alter the entire operating system.

Here is a short example of what can be done with this new capability. With a Level 1 machine, after running a program from T-Bug, once the machine loop hangs there is no way to return to the T-Bug. The only way to regain control of the system is to reset and reload the T-Bug tape. This can be changed by altering two locations of the operating system. Place the entry point of T-Bug at address 0010,0011. Press the Reset key and the

TRS-80 reset jump address control will return to T-Bug. Now if your machine program gets lost, you can Reset and return to T-Bug immediately. Any address may be placed at this restart location so control may be passed to a desired program with the Reset key.

With a little imagination, and some machine-language or assembly program software ability, you should find many uses for this modified operating system. ■

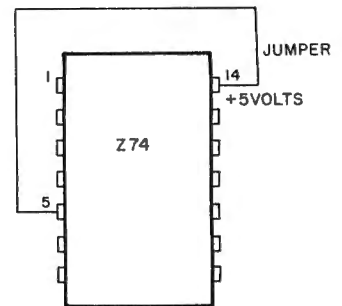


Fig. 5. This jumper must be installed to enable the data in buffers for memory addresses above 7FFF (Hex.).

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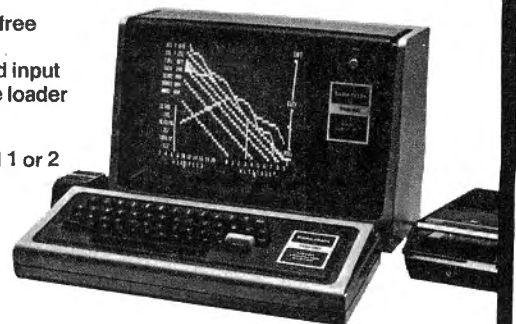
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Fifteen new commands for serious T-Bug aficionados.

Newbug

Ken Marks Jr.
 913 W. 62nd Street
 Downers Grove, IL 60516

Soon after I had Radio Shack's T-Bug, I realized that its nine commands did not provide enough programming power for the serious machine-code programmer. Mr. Curtis' article "T-Bug for II" in the April 1980 issue of *80 Microcomputing* started me thinking that others may find my modifications useful. Because I added 15 new commands to T-Bug and for the sake of clarity in this article, I have named the new version NEWBUG. The following source code listing may be assembled using Radio Shack's Editor/Assembler.

NEWBUG

Once you have the object code of the NEWBUG patch, simply load T-Bug II (the version of T-Bug modified with Mr. Curtis' enhancements), and

with the L command, load the patch. When the tape stops, the first difference you will notice is that the # prompt has become an *. This tells you that this is no longer T-Bug, but NEWBUG. Before you go any further, it would be wise to punch a copy of NEWBUG to tape. To do this, type P 4380 4C5C 4762 NEWBUG. If you use the V command to verify the dump, you will get an error message. This is because the input buffer is written to tape also, and when you go to verify the dump, the contents of this

buffer will have changed causing the apparent error. You don't have to fully understand this, but there is usually no need to worry. If you are using T-Bug to enter the patch, type in the jump in line 27 of the listing last. This is the line that converts T-Bug into NEWBUG. If you type it in before the rest of the patch is in place, it will wreak havoc with the system.

The following is a short description of some of the uses of the new commands. Keep in mind that these are only examples and you should feel free

to experiment with the commands where possible, but take care to heed any warnings given.

Clear

Occasionally the CRT screen gets cluttered up with alphanumeric or graphic characters. This can happen while debugging programs which display data or text on the screen. One way to clear the screen is to jump to Basic by executing a J 0072, hit the Clear key, and jump back to T-Bug. There is now a quicker and

```

                                Program Listing

                                "NEWBUG" a patch to modify T-BUG
                                written by Ken Marks Jr.   final copy 1/11/81

                                00001 ;
                                00002 ;
                                00003 ;
                                00004 ;
                                00005 BACK2 EQU 43A5H
                                00006 BACK EQU 43CDH
                                00007 NONE EQU 4401H
                                00008 DUTA EQU 4522H
                                00009 ASPC EQU 4532H
                                00010 CRS EQU 453CH
                                00011 SPC EQU 457BH
                                00012 INA EQU 4589H
    
```

Program continues

Program continued

45A7	00013	LST	EQU	45A7H	
45C8	00014	INKY	EQU	45C8H	
4762	00015	NEWBUG	EQU	4762H	
4825	00016	REGS	EQU	4825H	
482D	00017	FLAG	EQU	482DH	
483D	00018	CURSR	EQU	483DH	
43DE	00019		ORG	43DEH	
43DE 2A	00020		DEFB	2AH	; ADDRESS OF PROMPT
4782	00021		ORG	4782H	; CHANGE TO *
4782 C28D48	00022		JP	NZ,CLEAR	
4851	00023		ORG	4851H	; INSERT JUMP TO PATCH
4851 D9	00024	HLIN	EXX		; START OF PATCH
4852 CD8945	00025		CALL	INA	; THIS SUBROUTINE
4855 D9	00026		EXX		; LOADS THE HL
4856 67	00027		LD	H,A	; REGISTER WITH
4857 D9	00028		EXX		; AN INPUT FROM
4858 CD8945	00029		CALL	INA	; THE KEYBOARD
485B D9	00030		EXX		
485C 6F	00031		LD	L,A	
485D C9	00032		RET		
485E C5	00033	HLOUT	PUSH	BC	; THIS SUBROUTINE
485F 7C	00034		LD	A,H	; OUTPUTS THE
4860 CD6C48	00035		CALL	OUT	; CONTENTS OF
4863 7D	00036		LD	A,L	; THE HL REGISTER
4864 CD6C48	00037		CALL	OUT	; & A SPACE
4867 CD7B45	00038		CALL	SPC	; AT THE CURRENT
486A C1	00039		POP	BC	; CURSOR POSITION
486B C9	00040		RET		
486C 47	00041	OUT	LD	B,A	; THIS SUBROUTINE
486D CB3F	00042		SRL	A	; OUTPUTS THE
486F CB3F	00043		SRL	A	; CONTENTS OF THE
4871 CB3F	00044		SRL	A	; A REGISTER
4873 CB3F	00045		SRL	A	; AT THE CURRENT
4875 D9	00046		EXX		; CURSOR POSITION
4876 CD2245	00047		CALL	OUTA	
4879 D9	00048		EXX		
487A 78	00049		LD	A,B	
487B E60F	00050		AND	OFH	
487D D9	00051		EXX		
487E CD2245	00052		CALL	OUTA	
4881 D9	00053		EXX		
4882 C9	00054		RET		
4883 DF	00055	ERR	RST	18H	; COMPARE START AND END
4884 DB	00056		RET	C	; RETURN IF ALL OKAY
4885 2A3D48	00057		LD	HL, (CURSR)	; ELSE GET CURSOR POS.
4888 3645	00058		LD	(HL), 'E'	; OUTPUT AN "E"
488A C3A543	00059		JP	BACK2	; AND ABORT
488D FE63	00060	CLEAR	CP	63H	; CHECK FOR <CLEAR>
488F 200A	00061		JR	NZ, ARITHM	; GO IF NOT PRESSED
4891 AF	00062		XOR	A	; CLEAR A

Program continues

neater approach. The Clear key works just as it did in Basic, clearing the full screen and returning the * prompt to the upper left-hand corner.

Hexadecimal Arithmetic

Have you ever wanted to calculate an absolute address from a jump relative displacement value? Have you ever found the need to add or subtract two hex numbers for one reason or another? Well, my hexadecimal math has never been great, and the fact that even slight mathematical errors are enough to "bomb" a machine-code program should point out the usefulness of this command. It has saved me much needless grief. Type A (for arithmetic) followed by any four digit hexadecimal number. Now specify either addition or subtraction by typing + or -. You must now give the computer a number to be added to or subtracted from the first, so enter a second four digit number. An = and the resulting hex value will be displayed.

Selective Block Change

While working on a program, I found the need for a quick way to search for all the occurrences of a particular byte and then change them to another value in a specified block of memory. So, out of necessity rose the block change com-

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4892	322240	00063	LD	(4022H),A	;TURN CURSOR OFF
4895	CDC901	00064	CALL	1C9H	;CLEAR SCREEN
4898	C3CD43	00065	JP	BACK	;AND RETURN
489B	FE41	00066	CP	'A'	;CHECK FOR "A"
489D	203A	00067	JR	NZ,CHANGE	;GO IF NOT PRESSED
489F	CD3245	00068	CALL	ASPC	;OUTPUT (A) + SPACE
48A2	CD5148	00069	CALL	HLIN	;GET 1st OPERAND
48A5	E5	00070	PUSH	HL	;SAVE IT
48A6	CD7B45	00071	CALL	SPC	;SPACE
48A9	CDC845	00072	CALL	INKY	;LOAD A FROM KEYBOARD
48AC	FE2B	00073	CP	'+'	;ADDITION?
48AE	2806	00074	JR	Z,B2	
48B0	FE3D	00075	CP	'='	;SUBTRACTION?
48B2	20F5	00076	JR	NZ,B1	;NO. TRY AGAIN
48B4	D610	00077	SUB	10H	;CORRECT TO "--"
48B6	F5	00078	B2	PUSH AF	;SAVE OPERATOR
48B7	CD3245	00079	CALL	ASPC	;OUTPUT (A) + SPACE
48BA	CD5148	00080	CALL	HLIN	;GET 2nd OPERAND
48BD	E5	00081	PUSH	HL	;SAVE IT
48BE	CD7B45	00082	CALL	SPC	;SPACE
48C1	3E3D	00083	LD	A,'='	
48C3	CD3245	00084	CALL	ASPC	;OUTPUT "=" + SPACE
48C6	D1	00085	POP	DE	;POP OPERAND #2
48C7	F1	00086	POP	AF	;POP OPERATOR
48C8	E1	00087	POP	HL	;POP OPERAND #1
48C9	FE2B	00088	CP	'+'	;ADD?
48CB	2805	00089	JR	Z,PLUS	;GO IF (A)="+"
48CD	AF	00090	XOR	A	;CLEAR CARRY
48CE	ED52	00091	SBC	HL,DE	;AND SUBTRACT
48D0	1801	00092	JR	B3	
48D2	19	00093	PLUS	ADD HL,DE	;ADD
48D3	CD5E48	00094	B3	CALL HLOUT	;DISPLAY RESULT
48D6	C3A543	00095	JP	BACK2	;RETURN
48D9	FE43	00096	CHANGE	CP 'C'	;CHECK FOR "C"
48DB	2042	00097	JR	NZ,EXPAND	;GO IF NOT PRESSED
48DD	CD3245	00098	CALL	ASPC	;OUTPUT (A) + SPACE
48E0	CD5148	00099	CALL	HLIN	;GET START OF CHANGE
48E3	E5	00100	PUSH	HL	;SAVE IT
48E4	CD7B45	00101	CALL	SPC	;SPACE
48E7	CD5148	00102	CALL	HLIN	;GET END OF CHANGE
48EA	E5	00103	PUSH	HL	;SAVE IT
48EB	CD7B45	00104	CALL	SPC	;SPACE
48EE	CD8945	00105	CALL	INA	;GET TARGET BYTE
48F1	F5	00106	PUSH	AF	;SAVE IT
48F2	CD7B45	00107	CALL	SPC	;SPACE
48F5	CD8945	00108	CALL	INA	;GET NEW BYTE
48F8	47	00109	LD	B,A	;NEW BYTE -> B
48F9	F1	00110	POP	AF	;POP TARGET BYTE
48FA	E1	00111	POP	HL	;POP END
48FB	D1	00112	POP	DE	;POP START
48FC	F5	00113	PUSH	AF	;SAVE TARGET AGAIN
48FD	DF	00114	RST	18H	;CHECK FOR START>END
48FE	3009	00115	JR	NC,B4	;GO IF NOT
4900	2A3D48	00116	LD	HL,(CURSR)	;ELSE OUTPUT
4903	3645	00117	LD	(HL),'E'	; "E" FOR ERROR
4905	F1	00118	POP	AF	;RESTORE STACK
4906	C3A543	00119	JP	BACK2	;RETURN
4909	AF	00120	B4	XOR A	;CLEAR CARRY
490A	ED52	00121	SBC	HL,DE	;COMPUTE COUNT
490C	E5	00122	PUSH	HL	;SAVE IT
490D	D5	00123	PUSH	DE	;PUSH ALL ONTO STACK
490E	C5	00124	PUSH	BC	;TO SWITCH VALUES
490F	D1	00125	POP	DE	;NEW BYTE -> D
4910	E1	00126	POP	HL	;START -> HL
4911	C1	00127	POP	BC	;BYTE COUNT -> BC
4912	F1	00128	POP	AF	;TARGET BYTE -> A
4913	03	00129	INC	BC	;CORRECT BYTE COUNT
4914	03	00130	INC	BC	;BY ADDING 2
4915	EDB1	00131	L1	CPIR	;SEARCH FOR TARGET BYTE
4917	E2A543	00132	JP	PD,BACK2	;RETURN IF SEARCH OVER
491A	2B	00133	DEC	HL	;NOW HL POINTS TO TARGET
491B	72	00134	LD	(HL),D	;CHANGE TARGET INTO NEW
491C	23	00135	INC	HL	;RESTORE TO NORMAL
491D	18F6	00136	JR	L1	;CONTINUE 'TILL DONE
491F	FE45	00137	EXPAND	CP 'E'	;CHECK FOR "E"
4921	2044	00138	JR	NZ,HEXDMP	;GO IF NOT PRESSED
4923	214049	00139	LD	HL,MES	;POINT TO MESSAGE
4926	CD5349	00140	CALL	OUTMES	;OUTPUT
4929	0608	00141	LD	B,8	; (B) = BIT COUNT
492B	212D48	00142	L2	LD HL,FLAG	;ADDRESS OF T-BUG FLAG
492E	3E30	00143	LD	A,'0'	;BIT (B) ASSUMED = 0
4930	CB06	00144	RLC	(HL)	;LEFTMOST BIT -> CARRY
4932	3001	00145	JR	NC,B5	;BRANCH IF BIT = 0
4934	3C	00146	INC	A	;NOW (A) IS ASCII "1"

Program continues

mand. As a quick and visible display of this command's operation, try the following example: type C followed by the starting and ending addresses of the block of memory you wish to change. For this demonstration, type 3C00 and 3FFF. These are the starting and ending addresses of the video display memory. Choose the addresses carefully or you may find (the hard way) that writing over the vector restarts (immediately following the screen memory), the area of memory in which NEWBUG resides, or any other dedicated block of memory, can be hazardous to the well being of any program in memory.

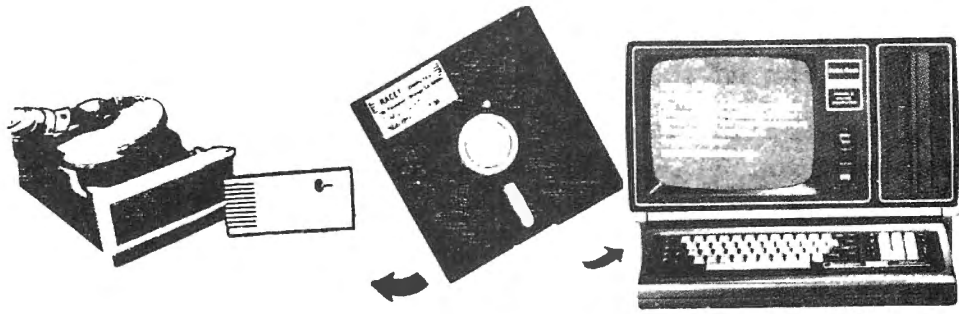
So far the command has done nothing. That is because we have not told it what byte to look for. Enter a two digit "target" byte followed by the byte that will replace it wherever it is found. For this example type 20 and BF. If you didn't follow what happened, the computer went searching through the video memory for all occurrences of 20 which is the ASCII code for a space and, upon finding them, changed each into BF which is the graphic code for all pixels (blocks) on. This is, of course, only an example and any values can be used, but take care in choosing safe values so that you don't "bomb" the system.

Expand Flag Register

The need to know the status of each individual flag bit in the flag register is important when debugging a program. The flag register can be displayed with the R command, but this is of little value unless you have memorized the position of each separate flag bit and have paper and pencil nearby to convert the hexadecimal digits into their binary equivalents. Press the R key and find the F register. Now press the E key. This will expand the register into its binary form. By comparing the hexadecimal output with its binary counterpart, you should find the command's operation quite reliable.

Hex/ASCII Dump

My need to display a full



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This comprehensive Diskette Cataloging/Indexing utility allows the user to keep track of thousands of programs in a categorized library. Machine language program works with all TRSDOS and NEWDOS versions. Files include program names and extensions, program length, diskette numbers, front and back, and diskette free space. RS232 drivers and other features.

LPSPPOOL (32K 1-drive Min) **Mod I \$75**

LPSPPOOL — Add multi-tasking to permit concurrent printing while running your application program. The spooler and despooler obtain print jobs from queues maintained by the system as print files are generated. LPSPPOOL supports both parallel and serial printers.

BASIC LINK FACILITY 'BLINK' (Mod I Min 32K 1-disk) **Mod I \$25; Mod II \$50; Mod III \$30**

Link from one BASIC program to another saving all variables! The new program can be smaller or larger than the original program in memory. The chained program may either replace the original program, or can be merged by statement number. The statement number where the chained program execution is to begin may be specified!

INFINITE BASIC (Mod I & Mod III Tape or Disk) **Mod I \$50; Mod III \$60**

Extends Level II BASIC with complete MATRIX functions and 50 more string functions. Includes RACET machine language sorts! Sort 1000 elements in 9 seconds!! Select only functions you want to optimize memory usage.

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Command Processor. Auto your disk to perform any sequence of instructions that you can give from the keyboard. DIR, FREE, pause, wait for user input, BASIC, No. of FILES and MEM SIZE, RUN program, respond to input statements, BREAK, return to DOS, etc. Includes lowercase driver software, debounce and screenprint!

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Includes RACET machine language SUPERZAP, Apparatus Disassembler, and Model II interface to the Microsoft 'Editor Assembler Plus' software package including uploading services and patches for Disk I/O. Purchase price includes complete copy of Editor Assembler + and documentation for Mod I. Assemble directly into memory. MACRO facility, save all or portions of source to disk, dynamic debug facility (ZBUG), extended editor commands.

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Program continued

4935 CD3245	00147 B5	CALL	ASPC	; OUTPUT (A) + SPACE
4938 10F1	00148	DJNZ	L2	; CONTINUE FOR ALL BITS
493A CD3C45	00149	CALL	CRS	; OUTPUT A C/R
493D C3A543	00150	JP	BACK2	; RETURN
4940 18	00151 MES	DEFB	18H	; BACKSPACE
4941 53	00152	DEFM	'S Z - H - P N C'	; FLAG MESSAGE
4950 0D20	00153	DEFM	200DH	; C/R AND SPACE
4952 00	00154	DEFB	0	; 0 MARKS THE END
4953 ED4B3D48	00155 OUTMES	LD	BC, (CURSR)	; OUTPUTS MESSAGE
4957 ED432040	00156	LD	(4020H), BC	; AT CURRENT CURSOR
495B CDA72B	00157	CALL	28A7H	; POSITION USING
495E ED4B2040	00158	LD	BC, (4020H)	; ROM OUTPUT
4962 ED433D48	00159	LD	(CURSR), BC	; ROUTINE
4966 C9	00160	RET		
4967 FE48	00161 HEXDMP	CP	'H'	; CHECK FOR "H"
4969 2066	00162	JR	NZ, INITIA	; GO IF NOT PRESSED
496B CD3245	00163	CALL	ASPC	; OUTPUT (A) + SPACE
496E CD5148	00164	CALL	HLIN	; GET START ADDRESS
4971 EB	00165	EX	DE, HL	; MOVE TO DE
4972 0E10	00166 HEXOUT	LD	C, 10H	; LINE COUNT
4974 2A3D48	00167	LD	HL, (CURSR)	; GET T-BUG CURSOR
4977 222040	00168	LD	(4020H), HL	; PUT IN BASIC CURSOR
497A EB	00169	EX	DE, HL	; SAVE DE
497B 3E0D	00170	LD	A, 0DH	; ODH = C/R
497D CD3300	00171	CALL	33H	; OUTPUT A C/R
4980 EB	00172	EX	DE, HL	; RESTORE DE
4981 2A2040	00173	LD	HL, (4020H)	; BASIC'S CURSOR
4984 223D48	00174	LD	(CURSR), HL	; BACK TO T-BUG'S
4987 62	00175	LD	H, D	; PUT DE INTO HL
4988 6B	00176	LD	L, E	
4989 CD5E48	00177	CALL	HROUT	; OUTPUT MEM POINTER
498C 3E5E	00178	LD	A, 5EH	; 5EH = RIGHT ARROW
498E CD3245	00179	CALL	ASPC	; OUTPUT ARROW
4991 D5	00180	PUSH	DE	; SAVE MEM POINTER

Program continues

page of 256 continuous bytes of memory in hexadecimal along with their associated ASCII symbols prompted this next command. If you type H 0000 you will see the first 256 bytes of ROM. Each line contains the starting address of that line followed by sixteen hexadecimal numbers grouped in twos. The ASCII symbols for these are printed to the right on each line. The cursor character is displayed in place of graphic and control characters. Press Enter to look at the next 256 bytes of memory. You should now see the second page of ROM which starts at 0100. If you look in the ASCII section, you will notice the data for the Radio Shack Level II Basic message. Press 1 if you want to look line by line through memory instead. By pressing any key 1-9, that many more lines will be displayed. Pressing 0, you will find, scans over the contents of the next 1024 bytes of memory. The scan feature can come in handy for

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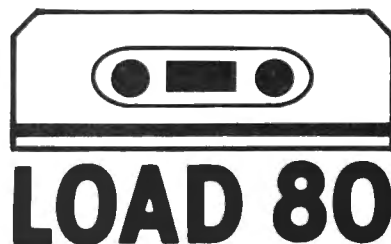
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searching large sections of memory. To exit this command, press X. I will mention here that the X key can be used to exit most of the new commands.

Initialize

When you first load NEWBUG and get ready to start debugging, or whenever you wish to clear all the workable registers, simply press I. This initializes NEWBUG by zeroing the register sets, both prime and non-prime, and the IX and IY index registers. The stack pointer (SP) and program counter (PC) are not zeroed because this would have disastrous effects. To convince yourself that the registers are in fact cleared, press I and then R and observe for yourself.

Block Checksum

Checksums are useful for comparing blocks of memory and for other special cases when you need to know the sum of a block of memory. Most checksums add together the values of all the bytes in the specified block of memory and display only the least significant byte of the resulting checksum. For most cases this is fine, but there are times when the total value of the checksum is needed. Type K for checksum (C was already used for the change command) followed by the starting and ending addresses of the block of memory of which you wish to compute the checksum. The resulting eight digit hexadecimal number is the computed checksum of the chosen block of memory. Because the checksum command is non-destructive (that is, it doesn't change any memory locations), it can be used anywhere in RAM or ROM. In all commands dealing with a block of memory the starting and ending memory locations are included in the operation and are said to be inclusive commands. You may also notice that if the starting address is larger than the ending address, an E will be printed and the command will be aborted. This is because the commands are not capable of operating on imaginary blocks of memory which end before


Program continued

```

4992 0608      00181      LD      B,8          ;FOR 8 PAIRS OF BYTES
4994 1A        00182 L3    LD      A,(DE)
4995 67        00183      LD      H,A        ;H=FIRST BYTE
4996 13        00184      INC     DE         ;INC POINTER
4997 1A        00185      LD      A,(DE)
4998 6F        00186      LD      L,A        ;L=SECOND BYTE
4999 13        00187      INC     DE         ;INC POINTER
499A CD5E4B    00188      CALL   HLOUT      ;OUTPUT A PAIR OF BYTES
499D 10F5      00189      DJNZ   L3         ;CONTINUE 8 TIMES
499F D1        00190      POP    DE         ;GET MEM POINTER AGAIN
49A0 2A3D4B    00191      LD      HL,(CURSR) ;CURSOR -> HL
49A3 0610      00192      LD      B,10H     ;FOR 16 CHARACTERS
49A5 1A        00193 L4    LD      A,(DE)    ;GET CHAR
49A6 FE20      00194      CP     ' '        ;TEST FOR LESS THAN 20H
49A8 3804      00195      JR     C,B6       ;(CONTROL CHARACTER)
49AA FEB1      00196      CP     81H        ;TEST FOR GRAPHIC CODE
49AC 3802      00197      JR     C,B7
49AE 3E5F      00198 B6    LD      A,5FH     ;SUBSTITUTE CHAR
49B0 77        00199 B7    LD      (HL),A    ;STORE CHAR
49B1 23        00200      INC     HL        ;INC SCREEN POINTER
49B2 13        00201      INC     DE        ;INC MEMORY POINTER
49B3 10F0      00202      DJNZ   L4         ;CONTINUE FOR 16 CHARS
49B5 0D        00203      DEC     C         ;DEC LINE COUNTER
49B6 20BC      00204      JR     NZ,HEXOUT+2 ;GO IF NOT DONE
49B8 D9        00205 B8    EXX     ;SAVE REGISTERS
49B9 CDCB45    00206      CALL   INKY       ;GET (A) FROM KEYBOARD
49BC D9        00207      EXX     ;RESTORE REGS
49BD FE5B      00208      CP     'X'        ;CHECK FOR EXIT
49BF CA914B    00209      JP     Z,CLEAR+4  ;CLS AND RETURN
49C2 FE0D      00210      CP     0DH        ;CHECK FOR C/R
49C4 28AC      00211      JR     Z,HEXOUT   ;OUTPUT 16 MORE LINES
49C6 D630      00212      SUB    30H        ;CORRECT ASCII
49C8 38EE      00213      JR     C,BB       ;IF LESS THAN 1
49CA FE0A      00214      CP     0AH
49CC 30EA      00215      JR     NC,BB      ;IF GREATER THAN 9
49CE 4F        00216      LD      C,A
49CF 18A3      00217      JR     HEXOUT+2   ;COUNT -> C
49D1 FE49      00218 INITIA CP     'I'        ;CONINUE
49D3 200D      00219      JR     NZ,CHKSUM  ;CHECK FOR "I"
49D5 21254B    00220      LD      HL,REGS   ;GO IF NOT PRESSED
49D8 0614      00221      LD      B,14H     ;(HL)=START OF REGISTERS
49DA 3600      00222 L5    LD      (HL),0    ;BYTE COUNT -> B
49DC 23        00223      INC     HL        ;ZERO A REGISTER
49DD 10FB      00224      DJNZ   L5         ;POINT TO NEXT
49DF C3914B    00225      JP     CLEAR+4    ;CONTINUE 'TILL DONE
49E2 FE4B      00226 CHKSUM CP     'K'        ;CLEAR SCREEN & RETURN
49E4 203C      00227      JR     NZ,NPUT    ;CHECK FOR "K"
49E6 CD3245    00228      CALL   ASPC       ;GO IF NOT PRESSED
49E9 CD514B    00229      CALL   HLIN       ;OUTPUT (A) + SPACE
49EC E5        00230      PUSH   HL         ;GET START OF CHECKSUM
49ED CD7B45    00231      CALL   SPC        ;SAVE START ADDRESS
49F0 CD514B    00232      CALL   HLIN       ;OUTPUT SPACE
49F3 E5        00233      PUSH   HL         ;GET END ADDRESS
49F4 CD7B45    00234      CALL   SPC        ;SAVE END
49F7 D1        00235      POP    DE         ;OUTPUT SPACE
49F8 13        00236      INC     DE        ;GET END
49F9 E1        00237      POP    HL         ;CORRECT FOR COUNT
49FA CD834B    00238      CALL   ERR        ;GET START
49FD D9        00239      EXX     ;CHECK FOR START>END
49FE 210000    00240      LD      HL,0      ;SWITCH REGS
4A01 E5        00241      PUSH   HL         ;CLEAR LSB OF CHECKSUM
4A02 D1        00242      POP    DE         ;CLEAR MSB OF CHECKSUB
4A03 E5        00243      PUSH   HL
4A04 C1        00244      POP    BC
4A05 D9        00245      EXX     ;CLEAR BC
4A06 7E        00246 B9    LD      A,(HL)    ;SWITCH REGS
4A07 D9        00247      EXX     ;GET BYTE
4A08 4F        00248      LD      C,A       ;SWITCH REGS
4A09 09        00249      ADD    HL,BC      ;BYTE INTO BC
4A0A 3001      00250      JR     NC,B10     ;ADD TO CHECKSUM
4A0C 13        00251      INC     DE        ;JUMP IF NO CARRY
4A0D D9        00252 B10   EXX     ;INC MSB OF CHECKSUM
4A0E 23        00253      INC     HL        ;SWITCH REGS
4A0F DF        00254      RST    18H       ;INC POINTER
4A10 38F4      00255      JR     C,B9       ;CHECK IF DONE
4A12 D9        00256      EXX     ;CONTINUE
4A13 EB        00257      EX     DE,HL      ;SWITCH REGS
4A14 CD5E4B    00258      CALL   HLOUT      ;PUT MSB IN HL
4A17 213D4B    00259      LD      HL,CURSR  ;OUTPUT IT
4A1A 35        00260      DEC    (HL)       ;GET CURSOR
4A1B EB        00261      EX     DE,HL      ;REMOVE SPACE
4A1C CD5E4B    00262      CALL   HLOUT      ;GET LSB IN HL
4A1F C3A543    00263      JP     BACK2      ;OUTPUT IT
;RETURN

```

Program continues



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Program continued

```

4A22 FE4E      00264 NPUT      CP      *N*      ;CHECK IF "N"
4A24 2054      00265      JR      NZ,OUTPT      ;GO IF NOT PRESSED
4A26 CD3245    00266      CALL    ASPC          ;OUTPUT (A) + SPACE
4A29 CD5148    00267      CALL    HLIN         ;GET START OF INPUT
4A2C EB        00268      EX      DE,HL        ;START -> DE
4A2D CD7B45    00269      CALL    SPC          ;SPACE
4A30 215E4C    00270      LD      HL,END+1     ;LOWEST ALLOWED -> HL
4A33 CD8348    00271      CALL    ERR         ;CHECK IF START IS LOW
4A36 EB        00272      EX      DE,HL        ;DE <-> HL
4A37 CD9302    00273      CALL    293H        ;READ LEADER
4A3A 060B      00274      LD      B,B          ;COUNT -> B
4A3C CD684A    00275      CALL    BLOK        ;INPUT (B) BYTES
4A3F FE3C      00276 L7      CP      3CH          ;DATA HEADER?
4A41 2014      00277      JR      NZ,ENTRY    ;NO. MUST BE ENTRY PT.
4A43 CD2C02    00278      CALL    22CH        ;FLIP/FLOP "*"
4A46 CD3502    00279      CALL    235H        ;READ BYTE
4A49 77        00280      LD      (HL),A      ;STORE IT
4A4A 23        00281      INC     HL           ;
4A4B 47        00282      LD      B,A         ;LOAD B WITH COUNT
4A4C CD684A    00283      CALL    BLOK        ;READ IN (B) BYTES
4A4F CD704A    00284      CALL    IN2         ;GET 2 MORE
4A52 CD704A    00285      CALL    IN2         ;AND ANOTHER 2
4A55 18EB      00286      JR      L7          ;CONTINUE LOADING
4A57 CD704A    00287 ENTRY  CALL    IN2         ;GET ENTRY POINT
4A5A 2B        00288      LD      HL          ;HL = END OF INPUT
4A5B EB        00289      EX      DE,HL       ;SAVE HL
4A5C 3E2D      00290      LD      A,"-"       ;
4A5E CD3245    00291      CALL    ASPC        ;OUTPUT "-" + SPACE
4A61 EB        00292      EX      DE,HL       ;GET END AGAIN
4A62 CD5E48    00293      CALL    HLOUT       ;OUTPUT END ADDRESS
4A65 C3A543    00294      JP      BACK2       ;RETURN
4A68 CD3502    00295 BLOK   CALL    235H        ;SUBROUTINE TO INPUT
4A6B 77        00296      LD      (HL),A      ;(B) BYTES FROM TAP
4A6C 23        00297      INC     HL           ;AND STORE AT (HL)
4A6D 10F9      00298      DJNZ   BLOK        ;
4A6F C9        00299      RET                ;
4A70 EB        00300 IN2     EX      DE,HL       ;SUBROUTINE TO INPUT
4A71 CD1403    00301      CALL    314H        ;2 BYTES AND
4A74 EB        00302      EX      DE,HL       ;STORE IN (HL)
4A75 73        00303      LD      (HL),E      ;
4A76 23        00304      INC     HL           ;
4A77 72        00305      LD      (HL),D      ;
4A78 23        00306      INC     HL           ;
4A79 C9        00307      RET                ;
4A7A FE4F      00308 OUTPT  CP      *0*         ;CHECK FOR "0"
4A7C 2025      00309      JR      NZ,QUE      ;GO IF NOT PRESSED
4A7E CD3245    00310      CALL    ASPC        ;OUTPUT (A) + SPACE
4A81 CD5148    00311      CALL    HLIN        ;GET START OF OUTPUT
4A84 E5        00312      PUSH   HL           ;SAVE IT
4A85 CD7B45    00313      CALL    SPC         ;SPACE
4A88 CD5148    00314      CALL    HLIN        ;GET END OF OUTPUT

```

Program continues

they start.

Tape Input

If you look at the source code listing of the NEWBUG patch, you will see that the code for the patch loads into three separate blocks of memory starting at 43DE, 4782, and 4851. Because the patch is non-continuous, it cannot be punched to tape to make a backup copy with the P command. The input command will read in any system formatted machine-code program and store a byte-for-byte image of the taped program in a memory buffer which you select. If you have assembled NEWBUG with an editor/ assembler and have the tape with the object code nearby, load the tape and type N 5000. The cassette drive should start, the tape should be read in, and the * should blink as usual. When the program is finished loading, the ending byte of the input buffer is displayed. Save the starting and ending addresses for use with the next command. You may examine the contents of the buffer with the H command if you wish.

Tape Output

Until now, the input command may seem to be of little use because the program stored in the buffer cannot be correctly copied to tape with the P command. Well, that's what the output command is

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for. Position the tape to where you wish to dump a backup copy, press the record and play buttons, and type O followed by the starting and ending addresses you should have saved from the last command. The tape will start rolling and a copy of the original program will be written to tape. If you want to make another copy of the program, just use the output command again using the same addresses. Unless you wipe out the copy of the program in the buffer, there is no need to load it for each copy you make. If you try to input into a buffer less than 4C5C, the computer will respond with an E. This is to protect NEWBUG from being written over accidentally.

Cue Tape

While positioning tapes for reading or writing, the small grey remote plug on the cassette recorder is constantly being pulled out. This leads to bent and worn out plugs. In an effort to save the plug, the Q command transfers control of the cassette to you. Control will be returned to the computer when you hit the X key.

Block Search

Some machine-code monitors have commands to search for occurrences of one or two bytes. I found the need to search for a string of three or more bytes at a time, so the variable length block search command became part of NEWBUG's menu of commands.

Suppose we wanted to know from where in ROM the sub-routine for clearing the screen (located at 01C9) was called. To do this, we have to search locations 0000 to 3000 (the block of memory containing the ROM) for occurrences of CD C9 01 which is the machine code for the instruction call 01C9. Type S 0000 3000 CD C9 01 and press Enter. The addresses are found and displayed eight to a line. Go ahead and use the M command to verify that the code is actually at these addresses. The uniqueness of this command is that the search key (in this case CD C9 01) may be

Program continued

4ABB E5	00315	PUSH	HL	; SAVE IT
4ABC CD7B45	00316	CALL	SPC	; SPACE
4ABF D1	00317	POP	DE	; POP END INTO DE
4A90 E1	00318	POP	HL	; POP START INTO HL
4A91 13	00319	INC	DE	; INC TO INCLUDE LAST BYTE
4A92 CD8348	00320	CALL	ERR	; CHECK FOR START>END
4A95 CD8402	00321	CALL	284H	; WRITE LEADER
4A98 7E	00322	LD	A, (HL)	; DATA -> A
4A99 CD6402	00323	CALL	264H	; OUTPUT A
4A9C 23	00324	INC	HL	; POINT TO NEXT
4A9D DF	00325	RST	18H	; CHECK IF DONE
4A9E 38F8	00326	JR	C, L8	; CHECK IF NOT
4AA0 C3A543	00327	JP	BACK2	; RETURN
4AA3 FE51	00328	CP	'Q'	; CHECK FOR "Q"
4AA5 2011	00329	JR	NZ, SEARCH	; GO IF NOT PRESSED
4AA7 CD3245	00330	CALL	ASPC	; OUTPUT (A) + SPACE
4AAA 3E04	00331	LD	A, 4	; SET BIT 2
4AAC D3FF	00332	OUT	(OFFH), A	; TURN ON CASSETTE
4AAE CDC845	00333	CALL	INKY	; SCAN KEYBOARD
4AB1 FE58	00334	CP	'X'	; STOP?
4AB3 20F9	00335	JR	NZ, B11	; CONTINUE IF NOT
4AB5 C3A543	00336	JP	BACK2	; RETURN
4ABB FE53	00337	CP	'S'	; CHECK FOR "S"
4ABA 206F	00338	JR	NZ, TRANSF	; GO IF NOT PRESSED
4ABC CD3245	00339	CALL	ASPC	; OUTPUT (A) + SPACE
4ABF CD5148	00340	CALL	HLIN	; GET START OF SEARCH
4AC2 E5	00341	PUSH	HL	; SAVE IT
4AC3 CD7B45	00342	CALL	SPC	; SPACE
4AC6 CD5148	00343	CALL	HLIN	; GET END OF SEARCH
4AC9 E5	00344	PUSH	HL	; SAVE IT
4ACA CD7B45	00345	CALL	SPC	; SPACE
4ACD D1	00346	POP	DE	; POP END
4ACE E1	00347	POP	HL	; POP START
4ACF 13	00348	INC	DE	; CORRECT COUNT
4AD0 CD8348	00349	CALL	ERR	; CHECK FOR START>END
4AD3 E5	00350	PUSH	HL	; SAVE START AGAIN
4AD4 D5	00351	PUSH	DE	; SAVE END ALSO
4AD5 CD8945	00352	CALL	INA	; GET 1st BYTE OF KEY
4ADB 210042	00353	LD	HL, 4200H	; START OF KEY BUFFER
4ADB 0E00	00354	LD	C, 0	; COUNT = 0
4ADD 77	00355	LD	(HL), A	; SAVE BYTE
4ADE D9	00356	EXX	L9	; SAVE REGISTERS
4ADF CD7B45	00357	CALL	SPC	; SPACE
4AE2 D9	00358	EXX	HL	; GET REGISTERS
4AE3 2B	00359	DEC	HL	; DEC BUFFER ADDRESS
4AE4 0C	00360	INC	C	; INC COUNT
4AE5 D9	00361	EXX	HL	; SAVE REGS
4AE6 CDC845	00362	CALL	INKY	; GET 1 INPUT
4AE9 FE0D	00363	CP	ODH	; C/R?
4AEB 280F	00364	JR	Z, B12	; IF SO THEN START
4AED CDA745	00365	CALL	LST	; ELSE GET OTHER HALF
4AF0 CD8C45	00366	CALL	INA+3	; OF THE INPUT
4AF3 D9	00367	EXX	HL	; GET REGS
4AF4 77	00368	LD	(HL), A	; STORE BYTE
4AF5 3E0F	00369	LD	A, 0FH	
4AF7 B9	00370	CP	C	; 16 INPUTS?
4AF8 20E4	00371	JR	NZ, L9	; GO IF NOT
4AFA 0C	00372	INC	C	; CORRECT COUNT
4AFB D9	00373	EXX	HL	; SAVE REGS
4AFC CD3C45	00374	CALL	CRS	; OUTPUT A C/R
4AFF D9	00375	EXX	HL	; GET REGS
4B00 D1	00376	POP	DE	; END OF SEARCH
4B01 E1	00377	POP	HL	; START OF SEARCH
4B02 41	00378	LD	B, C	; COUNT -> B
4B03 DD210042	00379	LD	IX, 4200H	; START OF LOOKUP KEY
4B07 DD7E00	00380	LD	A, (IX)	; GET KEY BYTE
4B0A DD2B	00381	DEC	IX	; DEC KEY POINTER
4B0C 23	00382	INC	HL	; INC MEMORY POINTER
4B0D BE	00383	CP	(HL)	; MATCH?
4B0E 2015	00384	JR	NZ, B15	; GO IF NOT
4B10 10F5	00385	DJNZ	B14	; LOOP B TIMES
4B12 E5	00386	PUSH	HL	; SAVE
4B13 C5	00387	PUSH	BC	; SAVE
4B14 AF	00388	XOR	A	; CLEAR CARRY
4B15 47	00389	LD	B, A	; B=0
4B16 ED42	00390	SBC	HL, BC	; (HL)=START OF FIND-1
4B18 23	00391	INC	HL	; CORRECT (HL)
4B19 CD5E48	00392	CALL	HLOUT	; OUTPUT (HL) + SPACE
4B1C 0603	00393	LD	B, 3	; OUTPUT 3 MORE SPACES
4B1E CD7B45	00394	CALL	SPC	
4B21 10FB	00395	DJNZ	SPA3	
4B23 C1	00396	POP	BC	; POP
4B24 E1	00397	POP	HL	; POP
4B25 DF	00398	RST	18H	; IS SEARCH OVER?

Program continues

Program continued

4B26 38DA	00399	JR	C, B13	; GO IF NOT
4B28 C3A543	00400	JP	BACK2	; RETURN IF FINISHED
4B2B FE54	00401 TRANSF	CP	'T'	; CHECK FOR "T"
4B2D 2046	00402	JR	NZ, WRITE	; GO IF NOT PRESSED
4B2F CD3245	00403	CALL	ASPC	; OUTPUT (A) + SPACE
4B32 CD5148	00404	CALL	HLIN	; GET START OF SOURCE
4B35 E5	00405	PUSH	HL	; SAVE IT
4B36 CD7B45	00406	CALL	SPC	; SPACE
4B39 CD5148	00407	CALL	HLIN	; GET END OF SOURCE
4B3C E5	00408	PUSH	HL	; SAVE IT
4B3D CD7B45	00409	CALL	SPC	; SPACE
4B40 CD5148	00410	CALL	HLIN	; GET START OF DESTINATION
4B43 E5	00411	PUSH	HL	; SAVE IT
4B44 CD7B45	00412	CALL	SPC	; SPACE
4B47 C1	00413	POP	BC	; DESTINATION -> BC
4B48 D1	00414	POP	DE	; SOURCE END -> DE
4B49 E1	00415	POP	HL	; SOURCE START -> HL
4B4A CD8348	00416	CALL	ERR	; CHECK IF START>END
4B4D EB	00417	EX	DE, HL	; DE <--> HL
4B4E AF	00418	XOR	A	; CLEAR CARRY
4B4F ED52	00419	SBC	HL, DE	; GET BYTE COUNT-1
4B51 23	00420	INC	HL	; CORRECT IT
4B52 D5	00421	PUSH	DE	; PUSH ALL ONTO STACK
4B53 C5	00422	PUSH	BC	; TO SWITCH
4B54 E5	00423	PUSH	HL	
4B55 C1	00424	POP	BC	; BYTE COUNT
4B56 D1	00425	POP	DE	; DESTINATION
4B57 E1	00426	POP	HL	; SOURCE
4B58 E5	00427	PUSH	HL	; SAVE AGAIN
4B59 B7	00428	OR	A	; CLEAR CARRY
4B5A ED52	00429	SBC	HL, DE	; FIND MOVE DIRECTION
4B5C E1	00430	POP	HL	; GET SOURCE AGAIN
4B5D 3806	00431	JR	C, B16	; GO IF MOVE BACKWARDS
4B5F EDB0	00432	LDIR		; MOVE IT
4B61 EB	00433	EX	DE, HL	; DE <--> HL
4B62 2B	00434	DEC	HL	; CORRECT TO END
4B63 180A	00435	JR	B17	
4B65 09	00436 B16	ADD	HL, BC	; FIND START OF MOVE+1
4B66 2B	00437	DEC	HL	; CORRECT START
4B67 EB	00438	EX	DE, HL	
4B68 09	00439	ADD	HL, BC	; FIND END OF MOVE+1
4B69 2B	00440	DEC	HL	; CORRECT ALSO
4B6A EB	00441	EX	DE, HL	
4B6B D5	00442	PUSH	DE	; SAVE END
4B6C EDB8	00443	LDDR		; MOVE BACKWARDS
4B6E E1	00444	POP	HL	; POP END FROM STACK
4B6F CD5E48	00445 B17	CALL	HL0UT	; DISPLAY END
4B72 C3A543	00446	JP	BACK2	; RETURN
4B75 FE57	00447 WRITE	CP	'W'	; CHECK FOR "W"
4B77 2074	00448	JR	NZ, ZERO	; GO IF NOT PRESSED

Program continues

from one to sixteen bytes long. If the key is sixteen bytes long, execution will begin automatically. However, if the key is less than sixteen bytes long, press Enter to start execution. Take care not to search for a byte or bytes which may occur at a great number of places because the command will print page after page of addresses without stopping until it has listed them all. If you don't have a full 48K of memory, typing the command S C000 FFFE FF Enter will show you what I am referring to.

Block Transfer

Transferring blocks of data from one place to another in memory requires writing a block move program and executing it. I found myself doing this so frequently that the transfer command was created to save time. As an example of this command's use, let's move the first page of ROM (0000 to 00FF) into RAM starting at 5000. Press T followed by the source block addresses 0000 and 00FF. Follow this with the starting address of the destination block which in this case is 5000. In no time at all the ending address of the destination block is displayed and the * prompt returns ready for your next command. Type H 5000 to have a glimpse of the data that was just transferred. You may wish to perform a checksum on

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the two blocks 0000 to 00FF and 5000 to 50FF to see that they are identical. The source and destination blocks were not overlapping but the command can handle them without losing data if they do overlap.

Direct Register Write

Did you ever wish that you could step in and write values directly into the active registers to alter the flow of a program that you were debugging? If so, you will enjoy this next command. Press W and you will see the contents of the AF register pair followed by a /. If you want to place a 1234 in the BC register pair and a 5678 in the IY index register, press Enter to advance to the BC pair and type 1234. Now press Enter until the IY register is displayed and type 5678. It's that easy. Are you convinced that they were changed? Don't take my word for it. Press R and see for yourself.

Zero Memory

This command will clear (by writing in 00s) any block of RAM memory. By typing Z 4C5C BFFF, the programming workspace of a 32K machine will be cleared. Users with a 48K machine will notice that Z 4C5C FFFF yields little more than an E being displayed. This is because the computer interprets FFFF as a -1. However, Z 4C5C FFFE works fine. This is a destructive command. Choose values wisely.

Memory Test

As a finish, press * and wait a moment. The resulting output tells you that the memory has been checked and is valid to the displayed address. If this first value is not your machine's top of memory, the cell at this address plus one may be faulty or intermittent. Press * a few times to confirm the results of the test. The test starts with the RAM immediately following NEWBUG. The test is non-destructive and does not change any of the memory that is tested. The second line of this output tells you at what size you set the current memory, in case you do not remember. ■

Program continued

4B79	CD3C45	00449	CALL	CRS	; OUTPUT A C/R	
4B7C	FD212D48	00450	LD	IY, REGS+8	; POINTS TO T-BUG'S AF REG	
4B80	DD21CE48	00451	LD	IX, MESREG	; START OF MESSAGE	
4B84	ED5B3D48	00452	B18	LD	DE, (CURSR)	; CURSOR -> DE
4B88	0605	00453	LD	B, 5	; CHAR COUNT = 5	
4B8A	DD7E00	00454	L10	LD	A, (IX+0)	; GET CHAR
4B8D	B7	00455	OR	A	; TEST FOR ZERO	
4B8E	CAA543	00456	JP	Z, BACK2	; RETURN IF DONE	
4B91	12	00457	LD	(DE), A	; STORE ON SCREEN	
4B92	DD23	00458	INC	IX	; INC MESSAGE PTR	
4B94	13	00459	INC	DE	; INC SCREEN PTR	
4B95	10F3	00460	DJNZ	L10	; LOOP 5 TIMES	
4B97	ED533D48	00461	LD	(CURSR), DE	; SAVE NEW SCREEN POSITION	
4B9B	FD6601	00462	LD	H, (IY+1)	; GET VALUE OF CURRENT	
4B9E	FD6E00	00463	LD	L, (IY+0)	; REGISTER INTO HL	
4BA1	FD23	00464	INC	IY	; UPDATE REG PTR	
4BA3	FD23	00465	INC	IY		
4BA5	CD5E48	00466	CALL	HROUT	; OUTPUT OLD REG CONTENTS	
4BA8	3E2F	00467	LD	A, '/'	; OUTPUT A "/"	
4BAA	CD3245	00468	CALL	ASPC		
4BAD	CDC845	00469	CALL	INKY	; GET INPUT FROM KEYBOARD	
4BB0	FE0D	00470	CP	ODH	; CHECK FOR <ENTER>	
4BB2	2811	00471	JR	Z, B19	; GO TO NEXT IF PRESSED	
4BB4	CDA745	00472	CALL	LST	; GET SECOND HALF OF A	
4BB7	CD8C45	00473	CALL	INA+3		
4BBA	CD5548	00474	CALL	HLIN+4	; CALL HERE TO COMPLETE	
4BBD	EB	00475	EX	DE, HL	; PUT NEW VALUE IN DE	
4BBE	FDE5	00476	PUSH	IY	; GET REGISTER PTR	
4BC0	E1	00477	POP	HL	; IN HL	
4BC1	28	00478	DEC	HL		
4BC2	72	00479	LD	(HL), D	; STORE NEW MSB	
4BC3	2B	00480	DEC	HL		
4BC4	73	00481	LD	(HL), E	; STORE NEW LSB	
4BC5	DDE5	00482	B19	PUSH	IX	; SAVE MESSAGE PTR
4BC7	CD3C45	00483	CALL	CRS	; OUTPUT C/R	
4BCA	DDE1	00484	POP	IX	; RESTORE MESSAGE PTR	
4BCC	18B6	00485	JR	B18	; CONTINUE	
4BCE	41	00486	MESREG	DEFM	'AF = BC = DE = HL = IX = IY = '	
4BEC	00	00487	DEFB	O	; 0 MARKS THE END	
4BED	FESA	00488	ZERO	CP	'Z'	; CHECK FOR "Z"
4BEF	201C	00489	JR	NZ, TEST	; GO IF NOT PRESSED	
4BF1	CD3245	00490	CALL	ASPC	; OUTPUT (A) + SPACE	
4BF4	CD5148	00491	CALL	HLIN	; GET START	
4BF7	E5	00492	PUSH	HL	; SAVE IT	
4BF8	CD7B45	00493	CALL	SPC	; SPACE	
4BF9	CD5148	00494	CALL	HLIN	; GET END	
4BFE	D1	00495	POP	DE	; POP START	
4BFF	EB	00496	EX	DE, HL	; SWITCH THEM	
4C00	13	00497	INC	DE	; INCLUDE LAST BYTE	
4C01	CD8348	00498	CALL	ERR	; CHECK FOR START>END	
4C04	3600	00499	B20	LD	(HL), 0	; "ZERO" (HL)
4C06	23	00500	INC	HL	; POINT TO NEXT	
4C07	DF	00501	RST	18H	; CHECK IF DONE	
4C08	38FA	00502	JR	C, B20	; GO IF NOT	
4C0A	C3A543	00503	JP	BACK2	; RETURN	
4C0D	FE2A	00504	TEST	CP	'*'	; CHECK FOR "*"
4C0F	C20144	00505	JP	NZ, NONE	; BACK TO T-BUG IF NOT	
4C12	213A4C	00506	LD	HL, MES2	; GET MESSAGE	
4C15	CD5349	00507	CALL	OUTMES	; OUTPUT IT	
4C18	215D4C	00508	LD	HL, END	; START OF USER MEMORY	
4C1B	23	00509	L11	INC	HL	; NEXT BYTE
4C1C	7E	00510	LD	A, (HL)	; GET CONTENTS	
4C1D	47	00511	LD	B, A	; SAVE IN B	
4C1E	2F	00512	CPL		; COMPLEMENT (A)	
4C1F	77	00513	LD	(HL), A	; PUT BACK IN (HL)	
4C20	BE	00514	CP	(HL)	; TEST MEMORY CELL	
4C21	70	00515	LD	(HL), B	; RESTORE TO ORIGINAL	
4C22	28F7	00516	JR	Z, L11	; CONTINUE IF ZERO	
4C24	2B	00517	DEC	HL	; BACK UP TO LAST GOOD	
4C25	CD5E48	00518	CALL	HROUT	; OUTPUT LAST GOOD BYTE	
4C28	214C4C	00519	LD	HL, MES3	; GET NEXT MESSAGE	
4C2B	CD5349	00520	CALL	OUTMES	; OUTPUT IT	
4C2E	2AB140	00521	LD	HL, (40B1H)	; GET MEMORY SIZE	
4C31	CD5E48	00522	CALL	HROUT	; OUTPUT ALSO	
4C34	CD3C45	00523	CALL	CRS	; OUTPUT C/R	
4C37	C3A543	00524	JP	BACK2	; RETURN	
4C3A	0D	00525	MES2	DEFB	ODH	; C/R
4C3B	4D	00526	DEFM	'MEMORY VALID TO '		
4C4B	00	00527	DEFB	O	; 0 MARKS THE END	
4C4C	0D	00528	MES3	DEFB	ODH	; C/R
4C4D	4D	00529	DEFM	'MEMORY SET AT '		
4C5D	00	00530	END	DEFB	O	; 0 MARKS THE END
4762		00531	END	NEWBUG		

Program continues

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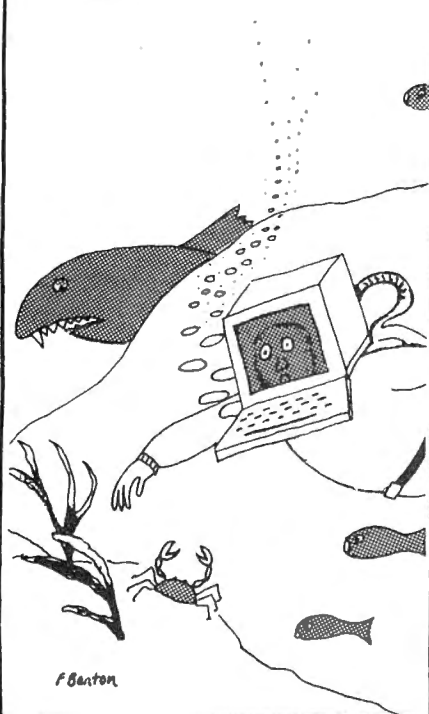
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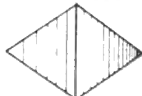
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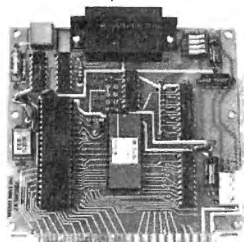
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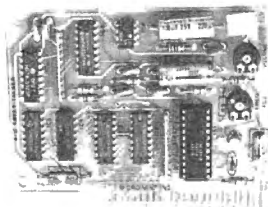
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Twelve new commands for good old Level II Basic.

Basic—Enhanced Again

Mark Goodwin
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When Radio Shack marketed their Model I they wanted it to appeal to a wide variety of users. The TRS-80 is a versatile machine but it does lack flexibility in more specific applications.

When I first acquired my computer, I was very excited about the graphics capabilities. But with my first attempts at creating games, I found the TRS-80 is limited in graphics capabilities. Many programs can be enhanced by the use of high speed graphics, but with Level II Basic fast graphics are just not possible.

I realized that if I wanted high speed graphics, I would have to take on a serious study of machine language. Once I learned

to create faster graphics by using machine language, I quickly found disadvantages to this method. The biggest disadvantage is the amount of time needed to develop a program. Furthermore, accessing machine language subroutines from Level II Basic can be frustrating.

So I began studying, to see if there was a way to add commands to Level II Basic. After a couple of years of experience with machine language, I finally found various ways to link up new commands with Level II Basic. From there it was a simple matter to write the machine language routines necessary to add virtually any command I wanted. Thus I created Enhanced Basic V1.0 (see Program Listing 1).

Enhanced Basic adds 12 new commands and modifies one existing command. It allows the user much more flexibility in writing graphic programs. Furthermore, it allows easier access to machine language subroutines in applications where even greater flexibility is required.

I do not intend to go into the details about how Enhanced Ba-

sic is written. The purpose of this article is not to instruct you on machine language programming, but to supply you with a useful modification to Level II Basic. Program Listings 2, 3, 4, 5

and 6 contain some brief examples of Enhanced Basic's versatility. ■

The program is available from the author.

Table 1. Command Descriptions

USRAddress,(x)

Calls a machine language subroutine at the address specified. Execution is the same as Level II USR(x) command in every other respect. This enables the program to contain an unlimited number of machine language subroutines, without the need of POKEing the entry address into memory.

Example:

```
100 X = USR27000,(N)
Is the same as:
100 POKE16526,120:POKE16527,105:X = USR(N)
```

X = ,(x,y)

This command allows for setting a double width graphics point. x must >= 0 and < 64 y must >= 0 and < 48

Example:

```
100 X = &#1,(32,23)
Is the same as:
100SET(64,23):SET(65,23)
```

X = ,(x,y)

This command allows resetting a double width graphics point. x must >= 0 and < 64 y must >= 0 and < 48

Example:

```
100 X = &#2,(32,23)
Is the same as:
```

Table continues



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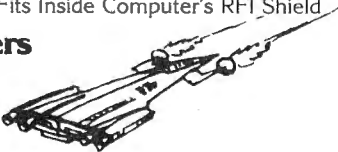
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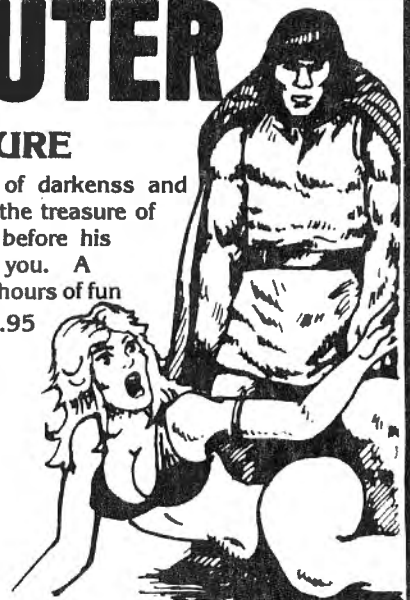
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Table continued

100 RESET(64,23):RESET(65,23)

X = ,(x,y)

This command allows the testing of a double width graphics point. It will return (-1 or true) if the point is set, otherwise returns (0 or false) if the point is reset.

Example:

100 IF,(32,23)THENX = ,(32,23)ELSEX = ,(32,23)

Tests to see if the point is set. If true then the point will be reset, else the point will be set.

X = ,n

This command will display byte n at all video locations.

Example:

100 X = ,191

is the same as:

100 FORN = 15360TO16383:POKEN,191:NEXT

**X = **

This command will invert all video locations containing characters greater than 127.

X = ,address,n,x,x,x,etc.

This command allows POKeIng multiple bytes into memory.

address = starting address

n = number of bytes to be POKEd

X = byte to be POKEd

Example:

100 X = ,27000,7,205,127,10,41,195,15,10

is the same as:

100 POKe27000,205:POKE27001,127:POKE27002,10:POKE27003,41:POKE27004,195:POKE27005,15:POKE27006,10

X = ,address

This command allows fetching from memory a 16 bit word.

Example:

100 X = ,27000

is the same as:

100 X = PEEK(27000) + PEEK(27001)*256

X = ,address,(value)

This command allows POKeIng a 16 bit word into memory

address = address to be POKEd

value = 16 bit word to be POKEd

Example:

100 X = ,27000,(27000)

is the same as:

100 POKe27000,120:POKE27001,105

X = 	,x,y,length

This command allows the drawing of a horizontal line.

x = horizontal starting position

y = vertical position of the line

length = length of the line

Example:

100 X = 	,0,128

is the same as:

100 FORX = 0TO127:SET(X,0):NEXT

**X =
,x,y,length**

This command allows the drawing of a vertical line.

x = horizontal position of the line

y = vertical starting position

length = length of the line

Example:

100 X =
,0,0,48

is the same as:

100 FORY = 0TO47:SET(0,Y):NEXT

X = ,x,y,length

This command allows the erasing of a horizontal line.

x = horizontal starting position

y = vertical position of the line

length = length of the line

Example:

100 X = ,0,0,128

is the same as:

100 FORX = 0TO127:RESET(X,0):NEXT

X = ,x,y,length

Table continues

Table continued

This command allows the erasing of a vertical line.

x = horizontal position of the line.

y = vertical starting position

length = length of the line

Example:

100 X = ,0,0,48

is the same as:

100 FORY = 0TO47:RESET(0,Y):NEXT

Program Listing 1.

```

42E9          00100          ORG      42E9H
42E9 CDC901  00110 START  CALL      1C9H          ;CLEARs SCRE
EN
42EC 21D244  00120          LD        HL,M1          ;POINT HL TO
MESSAGE
42EP CDA728  00130          CALL     28A7H          ;DISPLAY MES
SAGE
42F2 21F744  00140          LD        HL,BASIC      ;HL=START OF
BASIC-1
42F5 3600    00150          LD        (HL),0
42F7 23      00160          INC      HL
42F8 22A440  00170          LD        (40A4H),HL   ;START OF BA
SIC PROGRAM POINTER=HL
42FB 2AB140  00180          LD        HL,(40B1H)   ;HL=TOP OF B
ASIC MEMORY POINTER
42FE 11CEFF  00190          LD        DE,0FFCEH
4301 19      00200          ADD     HL,DE          ;HL=HL-50
4302 22A040  00210          LD        (40A0H),HL  ;START OF ST
RING SPACE POINTER=HL
4305 CD4D1B  00220          CALL     1B4DH          ;RESET POINT
ERS
4308 CD7644  00230          CALL     LEV3          ;CALL LINKUP
ROUTINE
430B C3191A  00240          JP        1A19H        ;RETURN TO B
ASIC
430E CD9D0A  00250 DUMMY  CALL     0A9DH          ;SET NTF TO
INTEGER
4311 210000  00260          LD        HL,0
4314 CD9A0A  00270          CALL     0A9AH          ;LOAD ACCUM
WITH ZERO
4317 2AE640  00280 RET1    LD        HL,(40E6H)   ;HL=ENCODED
STATEMUNT POINTER
431A C9      00290          RET
431B F5      00300 GRAPH  PUSH     AF            ;SAVE GRAPHI
CS MODE TO STACK
431C 7A      00310          LD        A,D          ;A=X VALUE
431D F5      00320          PUSH    AF            ;SAVE IT
431E 7B      00330          LD        A,E          ;A=Y VALUE
431F 218D01  00340          LD        HL,18DH     ;POINT TO DU
MMY STRING
4322 C35001  00350          JP        150H         ;GOTO GRAPHI
CS ROUTINE
4325 CF      00360 SUB1    RST      00H          ;CHECK SYNTA
X
4326 2C      00370          DEFB    ', '          ;MUST BE A ,
X
4327 CF      00380          RST      00H          ;CHECK SYNTA
X
4328 28      00390          DEFB    '( '          ;MUST BE A (
X
4329 CD1C2B  00400          CALL     2B1CH          ;EVALUATE EX
PRESSION
432C C9      00410          RET
432D CD2543  00420 SUB      CALL     SUB1          ;SEE IF X>63
4330 FE40    00430          CP        40H
4332 D24A1E  00440          JP        NC,1E4AH     ;IF>63 THEN
FC ERROR
4335 F5      00450          PUSH    AF            ;SAVE X VALU
E
4336 CD172B  00460          CALL     2B17H          ;EVALUATE EX
PRESSION
4339 FE30    00470          CP        30H          ;SEE IF Y>47
X
433B D24A1E  00480          JP        NC,1E4AH     ;IF>47 THEN
FC ERROR
433E F5      00490          PUSH    AF            ;SAVE Y VALU
E
433F CD8C01  00500          CALL     18CH          ;CHECK SYNTA
X
4342 22E640  00510          LD        (40E6H),HL  ;ENCODED STA
TEMENT POINTER=HL
4345 F1      00520          POP     AF            ;GET Y VALUE
X
4346 5F      00530          LD        E,A          ;SAVE IN E
4347 F1      00540          POP     AF            ;GET X VALUE
X
4348 87      00550          ADD     A,A          ;X=X*2
4349 57      00560          LD        D,A          ;SAVE IN D
434A C9      00570          RET
434B CD2143  00580 SET2    CALL     SUB           ;SAVE X,Y VA
LUE
434E D5      00590          PUSH    DE
434F 3E80    00600          LD        A,80H       ;A=SET GRAPH
ICS MODE
4351 CD1B43  00610          CALL     GRAPH        ;GET X,Y VAL
4354 D1      00620          POP     DE
4355 14      00630          INC     D              ;X=X+1
4356 3E80    00640          LD        A,80H       ;A=SET GRAPH

```

Program continues

Program continued

```

ICS MODE
4358 CD1B43 00650 CALL GRAPH
435B C30E43 00660 JF DUMMY ;RETURN TO B
ASIC PROGRAM
435E CD2D43 00670 RES2 CALL SUB
4361 D5 00680 PUSH DE ;SAVE X,Y VA
LUE
4362 3E01 00690 LD A,1 ;A=RESET GRA
PHICS MODE
4364 CD1B43 00700 CALL GRAPH
4367 D1 00710 POP DE ;GET X,Y VAL
UE
4368 14 00720 INC D ;X=X+1
4369 3E01 00730 LD A,1 ;A=RESET GRA
PHICS MODE
436B CD1B43 00740 CALL GRAPH
436E C30E43 00750 JF DUMMY ;RETURN TO B
ASIC PROGRAM
4371 CD2D43 00760 POI2 CALL SUB
4374 AF 00770 XOR A ;A=POINT GRA
PHICS MODE
4375 CD1B43 00780 CALL GRAPH
4378 CD7F0A 00790 CALL 0A7FH ;CONVERT ACC
UM TO INTEGER
437B CD9A0A 00800 CALL 0A9AH
437E C31743 00810 JF RET1 ;RETURN TO B
ASIC PROGRAM WITH VALUE
4381 CD172B 00820 WHITE CALL 2B17H ;EVALUATE EX
PRESSION
4384 22E640 00830 LD (40E6H),HL ;ENCODED STA
TEMENT POINTER=HL
4387 21003C 00840 LD HL,3C00H ;HL=START OF
VIDEO MEMORY
438A 010004 00850 LD BC,1024 ;BC=LENGTH O
F VIDEO MEMORY
438D 77 00860 WHIL LD (HL),A ;DISPLAY BYT
E AT (HL)
438E 23 00870 INC HL
438F 0B 00880 DEC BC
4390 57 00890 LD D,A ;SAVE BYTE T
O BE DISPLAYED
4391 78 00900 LD A,B ;CHECK
4392 B1 00910 OR C ; FOR END O
F MEMORY
4393 7A 00920 LD A,D
4394 20F7 00930 JR NZ,WHIL ;CONTINUE UN
TIL END OF VIDEO MEMORY
4396 C30E43 00940 JF DUMMY
4399 22E640 00950 REV LD (40E6H),HL
439C 21003C 00960 LD HL,3C00H ;HL=START OF
VIDEO MEMORY
439F 010004 00970 LD BC,0400H ;BC=LENGTH O
F VIDEO MEMORY
43A2 7E 00980 REV2 LD A,(HL) ;A=VIDEO MEM
ORY (HL)
43A3 FE00 00990 CP 00H ;CHECK FOR G
RAPHICS CODE
43A5 3006 01000 JR C,REV1 ;IF NOT GOTO
REV1
43A7 2F 01010 CPL ;INVERT A
43A8 CBFF 01020 SET 7,A ; SET BIT 7
ICCS MODE
43AA CBB7 01030 RES 6,A ; RESET B
IT 6
43AC 77 01040 LD (HL),A ;DISPLAY BYT
E
43AD 23 01050 REV1 INC HL
43AE 0B 01060 DEC BC
43AF 78 01070 LD A,B ;CHECK
43B0 B1 01080 OR C ; FOR END O
F VIDEO MEMORY
43B1 20EF 01090 JR NZ,REV2 ; IF NOT
JUMP
43B3 C30E43 01100 JF DUMMY
43B6 CF 01110 POKE RST 08H ;CHECK SYNTA
X
43B7 2C 01120 DEFB ', ' ;MUST BE A ,
G ADDRESS
43B8 CD022B 01130 CALL 2B02H ;GET STARTIN
G ADDRESS
43BB D5 01140 PUSH DE ;SAVE IT
43BC CD172B 01150 CALL 2B17H ;GET NUMBER
OF BYTES
43BF F5 01160 PUSH AF ;SAVE IT
43C0 22E640 01170 LD (40E6H),HL
43C3 1801 01180 JR POK1
43C5 C5 01190 POK2 PUSH BC
43C6 2AE640 01200 POK1 LD HL,(40E6H)
43C9 CD172B 01210 CALL 2B17H ;GET BYTE TO
BE POKED
43CC 22E640 01220 LD (40E6H),HL
43CF C1 01230 POP BC
43D0 E1 01240 POP HL
43D1 77 01250 LD (HL),A ;POKE BYTE
43D2 23 01260 INC HL
43D3 E5 01270 PUSH HL
43D4 10F7 01280 DJNZ POK2 ;IF BYTES LE
FT JUMP
43D6 E1 01290 POP HL
43D7 C30E43 01300 JF DUMMY
43DA CD012B 01310 USR CALL 2B01H ;GET ADDRESS
43DD ED530E40 01320 LD (40E6H),DE ;SAVE IN ENT
RY POINT LOCATTION
43E1 CF 01330 RST 08H ;CHECK SYNTA
X
43E2 2C 01340 DEFB ', ' ;MUST BE A ,
43E3 2B 01350 DEC HL
43E4 C9 01360 RET
43E5 CF 01370 FETCH RST 08H ;CHECK SYNTA
X

```

Program continues

Program continued

```

43E6 2C 01380 DEFB ', ' ;MUST BE A ,
43E7 CD022B 01390 CALL 2B02H ;GET ADDRESS
43EA 22E640 01400 LD (40E6H),HL
43ED D5 01410 PUSH DE
43EE E1 01420 POP HL
43EF 7E 01430 LD A,(HL)
43F0 4F 01440 LD C,A ;C=LSB
43F1 23 01450 INC HL
43F2 7E 01460 LD A,(HL)
43F3 47 01470 LD B,A ;B=MSB
43F4 C5 01480 PUSH BC
43F5 E1 01490 POP HI
43F6 CD9A0A 01500 CALL 0A9AH ;SAVE VALUE
43F9 C31743 01510 JF RET1 ;RETURN WITH
VALUE
43FC CF 01520 STORE RST 08H ;CHECK SYNTA
X
43FD 2C 01530 DEFB ', ' ;MUST BE A ,
43FE CD022B 01540 CALL 2B02H ;GET ADDRESS
4401 D5 01550 PUSH DE
4402 CF 01560 RST 08H ;CHECK SYNTA
X
4403 2C 01570 DEFB ', ' ;MUST BE A ,
4404 CF 01580 RST 08H ;CHECK SYNTA
X
4405 28 01590 DEFB '( ' ;MUST BE A (
4406 CD022B 01600 CALL 2B02H ;GET NUMBER
4409 D5 01610 PUSH DE
440A CD0C01 01620 CALL 18CH ;CHECK SYNTA
X
440D 22E640 01630 LD (40E6H),HL
4410 D1 01640 POP DE
4411 E1 01650 POP HL
4412 7B 01660 LD A,E
4413 77 01670 LD (HL),A ;POKE LSB
4414 23 01680 INC HL
4415 7A 01690 LD A,D
4416 77 01700 LD (HL),A ;POKE MSB
4417 C30E43 01710 JF DUMMY
441A CD172B 01720 LINES CALL 2B17H ;GET X VALUE
441D F5 01730 PUSH AF
441E CD172B 01740 CALL 2B17H ;GET Y VALUE
4421 F5 01750 PUSH AF
4422 CD172B 01760 CALL 2B17H ;GET LENGTH
4425 22E640 01770 LD (40E6H),HL
4428 47 01780 LD B,A ;B=LENGTH
4429 F1 01790 POP AF
442A 5F 01800 LD E,A ;E=Y VALUE
442B F1 01810 POP AF
442C 57 01820 LD D,A ;D=X VALUE
442D C9 01830 RET
442E CD1A44 01840 HLINS CALL LINES
4431 3E00 01850 HLIL LD A,08H ;A=SET GRAPH
ICS MODE
4433 C5 01860 PUSH BC
4434 D5 01870 PUSH DE
4435 CD1B43 01880 CALL GRAPH
4438 D1 01890 POP DE
4439 C1 01900 POP BC
443A 14 01910 INC D
443B 10F4 01920 DJNZ HLIL ;LOOP TILL L
INE SET
443D C30E43 01930 JP DUMMY
4440 CD1A44 01940 VLINS CALL LINES
4443 3E00 01950 VLIL LD A,08H ;A=SET GRAPH
ICS MODE
4445 C5 01960 PUSH BC
4446 D5 01970 PUSH DE
4447 CD1B43 01980 CALL GRAPH
444A D1 01990 POP DE
444B C1 02000 POP BC
444C 1C 02010 INC E
444D 10F4 02020 DJNZ VLIL ;Y=Y+1
;LOOP TILL L
INE SET
444F C30E43 02030 JP DUMMY
4452 CD1A44 02040 HLINR CALL LINES
4455 3E01 02050 HLI2 LD A,1 ;A=RESET GRA
PHICS MODE
4457 C5 02060 PUSH BC
4458 D5 02070 PUSH DE
4459 CD1B43 02080 CALL GRAPH
445C D1 02090 POP DE
445D C1 02100 POP BC
445E 14 02110 INC D
445F 10F4 02120 DJNZ HLIL ;X=X+1
;LOOP TILL L
INE RESET
4461 C30E43 02130 JP DUMMY
4464 CD1A44 02140 VLINR CALL LINES
4467 3E01 02150 VLI2 LD A,1 ;A=RESET GRA
PHICS MODE
4469 C5 02160 PUSH BC
446A D5 02170 PUSH DE
446B CD1B43 02180 CALL GRAPH
446E D1 02190 POP DE
446F C1 02200 POP BC
4470 1C 02210 INC E
4471 10F4 02220 DJNZ VLI2 ;Y=Y+1
;LOOP TILL L
INE RESET
4473 C30E43 02230 JP DUMMY
4476 3EC3 02240 LEV3 LD A,0C3H
4478 329441 02250 LD (4194H),A ;SET UP
447B 218B44 02260 LD HL,PT ; &
447E 229541 02270 LD (4195H),HL ; LINK

```

Program continues

Program continued

```

4481 32A941 02280 LD (41A9H),A ;SET UP
4484 21DA43 02290 LD HL,USR ; USR
4487 22AA41 02300 LD (41AAH),HL ; LINK
448A C9 02310 RET
448B D7 02320 PT RST 10H
448C CF 02330 RST 08H ;CHECK SYNTA
X
448D 23 02340 DEFB '#';MUST BE A #
448E CD1C2B 02350 CALL 2B1CH ;GET COMMAND
NUMBER
4491 FE0D 02360 CP 13
4493 D24ALE 02370 JP NC,1E4AH ;IF COMMAND
#>12 THEN FC ERROR
4496 FE01 02380 CP 1
4498 CA4B43 02390 JP Z,SET2
449B FE02 02400 CP 2
449D CA5E43 02410 JP Z,RES2
44A0 FE03 02420 CP 3
44A2 CA7143 02430 JP Z,POI2
44A5 FE04 02440 CP 4
44A7 CA8143 02450 JP Z,WHITE
44AA FE05 02460 CP 5
44AC CA9943 02470 JP Z,REV
44AF FE06 02480 CP 6
44B1 CAB643 02490 JP Z,POKE
44B4 FE07 02500 CP 7
44B6 CAE543 02510 JP Z,FETCH
44B9 FE08 02520 CP 8
44BB CAFCA3 02530 JP Z,STORE
44BE FE09 02540 CP 9
44C0 CA2E44 02550 JP Z,HLINS
44C3 FE0A 02560 CP 10
44C5 CA4044 02570 JP Z,VLINS
44C8 FE0B 02580 CP 11
44CA CA5244 02590 JP Z,HLINR
44CD FE0C 02600 CP 12
44CF CA6444 02610 JP Z,VLINR
44D2 45 02620 M1 DEFB 'ENHANCED BASIC V1.0'
44E5 0D 02630 DEFB 0DH
44E6 42 02640 DEFB 'BY MARK GOODWIN'
44F5 0D00 02650 DEFB 0DH
44F7 00 02660 BASIC DEFB 0'
42E9 02670 END START

```

```

10 CLS
20 X = &#8,27000,7,205,127,10,41,195,154,10
30 FORN = 1TO10:PRINTN;"*2 = ";USR27000,(N):NEXT

```

Program Listing 2

```

10 CLS
20 FORN = 0TO63
30 FORN1 = 0TO47STEP2
40 X = &#1,(N,N1)
50 NEXTN1,N
60 FORN = 0TO63
70 FORN1 = 0TO47
80 IF&#3,(N,N1)THENX = &#2,(N,N1)ELSEX = &#1,(N,N1)
90 NEXTN1,N
100 GOTO60

```

Program Listing 3

```

10 CLS
20 X = &#4,190:PRINT@0,"HELLO";
30 IFINKEY$ = ""THEN30
40 X = &#5
50 GOTO50

```

Program Listing 4

```

10 CLS
20 X = &#8,27000,(12345)
30 PRINT&#7,27000

```

Program Listing 5

```

10 CLS
20 FORN = 0TO47:X = &#9,0,N,128:NEXT
30 FORN = 47TO0STEP - 1:X = &#11,0,N,128:NEXT
40 FORN = 0TO127:X = &#10,N,0,48:NEXT
50 FORN = 127TO0STEP - 1:X = &#12,N,0,48:NEXT

```

Program Listing 6



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With a mite of effort, it'll work on your Model III!

T-Bug III

Kevin Kleinfelter
3337 Sevier Ave, Apt. 3
Knoxville, TN 37920

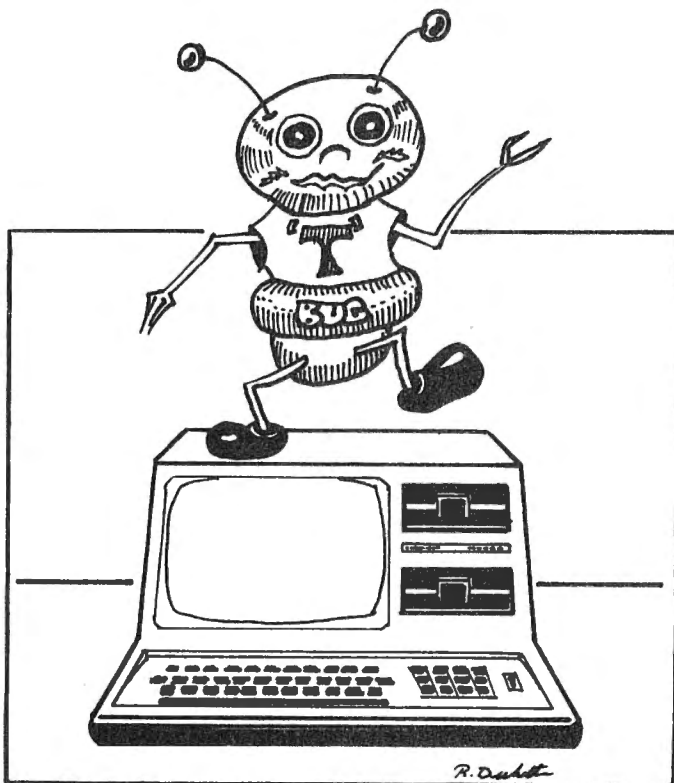
When you bought your Model III you may have been told, "And we'll have T-Bug for Model III very soon." Well, after three months of waiting, I finally gave up and fixed it myself. This article will show how easily you can make T-Bug run on your Model III.

A First Attempt

Unwilling to believe Radio Shack, I loaded my Level II T-Bug into my Model III and tried it out. Voila...all the commands worked except the tape routines. Upon studying dumps of T-Bug and ROM, I learned that the tape I/O performed by T-Bug is completely incompatible with Model III. The solution? Replace T-Bug's tape routines with Model III ROM routines.

Step 1

Load T-Bug at 500 baud. The punch command's tape routines are replaced by ROM calls here. In place of T-Bug's routines, put ROM's write header, write byte, and cassette off routines. Use



T-Bug's memory command to make the changes shown in Fig. 1.

Steps 2 and 3

Now the T-Bug routines for the Load command are replaced by calls to ROM's read header, read byte, and cassette off. Once again use the memory command (see Fig. 2).

Finally, use the memory command to change location 4211 (hex) to anything but 00. This sets the cassette speed to 1500 baud. Set up the tape recorder and type "P 4380 4980 43A0 TBUG" and hit Enter. While you're at it, why not punch out several copies so you won't have to rewind after each load?

As with all new programs, test your new T-Bug thoroughly. Also, you probably will want to look up one of those articles about relocating T-Bug to high memory.

Another Choice

Alternatively, you can use an assembler (perhaps EDTASM modified to run on Model III) to make a patch tape. Load EDTASM, then the patch tape, and then take T-Bug and punch out several copies. Now you have your own T-Bug III! ■

ADDR	INSERT
46DD	000000
46EB	CD8702
46EE	180B
46FE	6402
4706	6402
4713	6402
4717	6402
4725	6402
4729	6402
4731	6402
4737	6402
473D	6402
4740	F801
4746	6402
474A	6402
4750	6402
4759	6402

Fig. 1

ADDR	INSERT
4643	000000
4647	9602
4649	1807
464B	AF
464C	00000000
4653	3502
465C	3502
4661	3F3C
4666	3F3C
4669	3502
4674	3502
467D	3502
4686	3502
4699	F801
469D	3502
46A1	3502

Fig. 2

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Pocket Stats

*Dr. Walter J. Atkins, Jr.
Qtrs. 4410A
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As an educator and scientist, I frequently need to find statistics for a set of data. I have found my TRS-80 Pocket Computer ideal for making these calculations.

This program will find and display a great deal of statistical information. It will accept a data set of up to approximately sixty values, and will find the average value, the variance, the standard deviation, the median value, the high and low data values, and the midrange of the set.

I had just finished writing and testing this program when I read Len Gorney's article, "On the Average," in the May 1981 issue of *80*. That prompted me to include the midrange calculation in this program. His article is also a good reference for explanations of the mean, mid-

range, and median.

The variance and the standard deviation are statistics that indicate how much data values deviate from the mean. The standard deviation is the square root of the variance. One use of the standard deviation is in assigning grades to test scores. The mean value of the students' scores is assigned the grade of C. The scores in the B range lie one standard deviation above the mean. The scores in the A range lie two standard deviations above the mean. Likewise, scores assigned D and F are one and two standard deviations below the mean.

The following numbers represent the scores that a group of students received on a test; we'll use the Pocket Computer to find the statistics for these grades. The students' grades are 47, 52, 57, 65, 72, 77, 55, 61, 85, 87, 66, 75, 98, 88, and 73.

The mean value of the fifteen scores is 70.533. The variance is 219.552. The standard deviation is 14.817. The highest set value is 98. The lowest value is 47. Thus, the midrange value is 72.5. To calculate the median

value, the computer first sorts the values into ascending order, which takes about one minute and thirteen seconds for the 15 data values used here. Since there is an odd number of values, the median is the value in the middle of the sorted list. In this case that is 72.

The portability of the Pocket Computer facilitates data analysis almost anywhere, I use my computer so much that it is never further away than my briefcase.

The Program

The program is 53 lines long. It is capable of storing a data set and its associated statistics so the data can be entered at one time and the statistic read out at another.

Line 150 allows the display of a previously stored data set and its associated statistics. Line 170 initializes program variables. Lines 180-240 enter and store the values. Lines 250-330 calculate and display all statistics except for the median value. Line 340 determines if the median is to be calculated. Lines 370-400 sort the values into ascending order.

Lines 410-440 calculate and display the median value. Line 450 allows the data entered to be stored in the Pocket Computer's permanent memory for later recall. Lines 500-530 display a stored data set.

The variables used in the program are shown in Table 1. ■

A	
B	
C	
D	— Data value
E	
F	
G	— Sum of data values
H	— High data value
I	— Sum of squared data values
J	
K	— Sort flag
L	— Low data value
M	
N	— Number of data points
O	
P	— Mean value
Q	— Median value
R	
S	— Standard Deviation value
T	— Store data flag
U	— Midrange value
V	— Variance value
W	— Median routine pointer
X	— Loop counter
Y	— Storage array pointer
Z	— Median calculated flag

Table 1.

Statistics Program Variables

```

100 REM *STATISTICS*
110 REM *W.J. ATKINS*
120 REM *COPYRIGHTED*
130 REM *MAY81*
140 PAUSE " * STATISTICS * "
150 IF T=1 INPUT "DSPLY STORED DATA (Y/N)?":R$:IF R$="Y"
    THEN 500
160 IF T=1 INPUT "CLEAR DATA (Y/N)?":R$:IF R$="N" THEN 150
170 D=0:G=0:H=0:I=0:N=0:F=0:Q=0:S=0:T=0:U=0:Z=0
180 INPUT "HOW MANY DATA VALUES? ":N
190 Y=27:L=999999
200 FOR K=1 TO N
210 INPUT "DATA VALUE=> ":D:R$(Y)=D:Y=Y+1
220 G=G+D:IF D>H LET H=D
230 I=I+D:IF D<L LET L=D
240 NEXT K
250 F=G/N
260 U=(I-G*N)/(N-1):S=√U
270 USING "####.###"
280 PRINT "AVERAGE (MEAN)=":F
290 PRINT "VARIANCE=":U
300 PRINT "STANDARD DEV.=":S
310 PRINT "HIGH DATA VALUE=":H
320 PRINT "LOW DATA VALUE=":L
330 U=(H+L)/2:PRINT "MIDRANGE VALUE=":U
340 IF Z=0:INPUT "COMPUTE MEDIAN (Y/N)?":R$:W=INT(N/2):
    IF R$="N" THEN 450
350 IF Z=1 THEN 440
360 PAUSE "PLEASE WAIT"
370 K=0:FOR X=27 TO N+26
380 IF A(K):A(K)+1 LET A=A(K):B=A(K)+1:A(K)=B:A(K)+1=A(K)+1
390 NEXT K
400 IF K=1 THEN 370
410 IF W<2:LET B=(A(W+26)+A(W+27))/2:GOTO 430
420 G=A(W+27)
430 BEEP 2
440 PRINT "MEDIAN=":G:Z=1
450 INPUT "RETAIN DATA (Y/N)?":R$:IF R$="N" LET T=0:
    GOTO 470
410 T=1
420 GOTO 140
500 REM *DATA DISPLAY*
505 PRINT "NUMBER OF DATA=":N
510 FOR X=27 TO N+26
520 PRINT "DATA=":A(X):NEXT X
530 GOTO 270

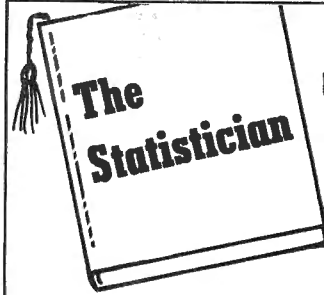
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Program Listing. Pocket Computer Statistics Program

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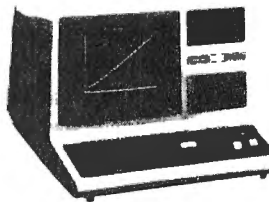
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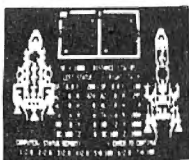
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RELOAD 80

You've noticed those LOAD80 tape files with the note, "Needs EDTASM" in the comments column. These are machine language programs in source code format. Radio Shack's EDITor/ASseMbler (EDTASM) is required to load and use these files. If you have ignored them because you didn't want to take the time to learn how to use the Editor/Assembler here is a quick tutorial to help you get started.

The Radio Shack Editor/Assembler for the Model I and the newly released package for the Model III both use the same command structure. There are tape and disk versions for both TRS-80 Models. The machine language programs in 80 Microcomputing are always printed in EDTASM format. These programs are listed as assembly language source code files. These programs must be entered into the computer using the Editor/Assembler, either by

hand or from tape, and then assembled and recorded on a separate tape (or disk) before they can be run. Remember, a source code file will *not* run—it must be assembled first.

To load a LOAD80 source code file, first load your EDTASM program. Once loaded, you should see the asterisk (*) prompt. Now, type L (or LT or LD with a disk based version), followed by an equals (=) sign, and a filename. (If you press the space bar five or six times in place of the filename, EDTASM will load the first file it encounters—for tape files only.) Then press PLAY on your tape recorder to load your file. The familiar asterisk pair will appear and one will flash on and off as the file loads.

When the source code file is loaded, enter P#:* to list the file on the screen. Inspect this listing as you would a Basic program to ensure that you have a good load. If the load is bad, reload

the file. Data will be in the buffer and EDTASM will ask if you are concatenating. Concatenating means combining two files to make one. In most cases, you will answer the concatenating question, N for 'no.'

Now that your file is loaded and verified, you can assemble the program by answering 'A' to the * prompt. After the 'A,' add a filename (six characters or less). The file will then be assembled and EDTASM will prompt you to ready your cassette for the object code file. Your EDTASM documentation contains some optional parameters that you can specify, using the slash (/) as a delimiter. These optional parameters include: NO for no object code, NS for no symbol table, LP for output to the lineprinter, and so on.

Once you have made an object code tape, you can load the tape using the Basic SYSTEM command to load machine language programs. If the program fails to perform as you desire, reload the original source code file and use EDTASM's edit function to modify the program to suit you. Then assemble and run the new version and see how it goes!

Our Circulation Department reports that the custom software written to handle the LOAD80 subscription program is nearly ready. The new year will probably see a subscription offer for LOAD80. Details forthcoming in December.

Next month, Holiday goodies for LOAD80 users. ■

November LOAD80 Directory

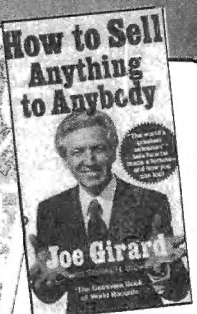
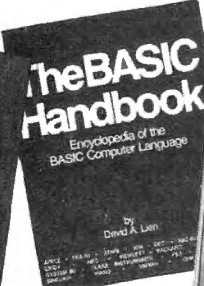
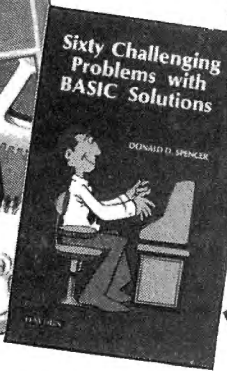
Program	Title	Page #	Comments
1	TENANT	138	None
2	INVEST	144	None
3	HOUSE	160	None
4	GRAPHS	176	None
5	PRODTIMER	220	None
6	CHAIN	250	Needs EDTASM
7	ALTER	274	None
8	CREDUN	321	None
9	SPRLIST	333	None
10	SECSRC	348	None
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12	ENHANCE	384	None

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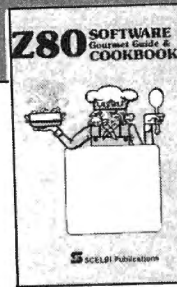
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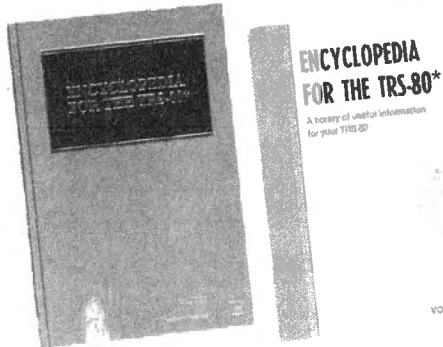
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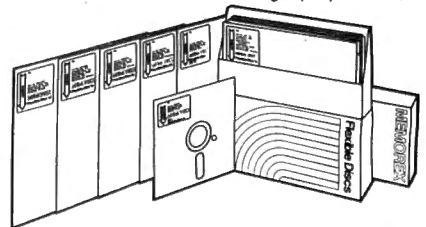
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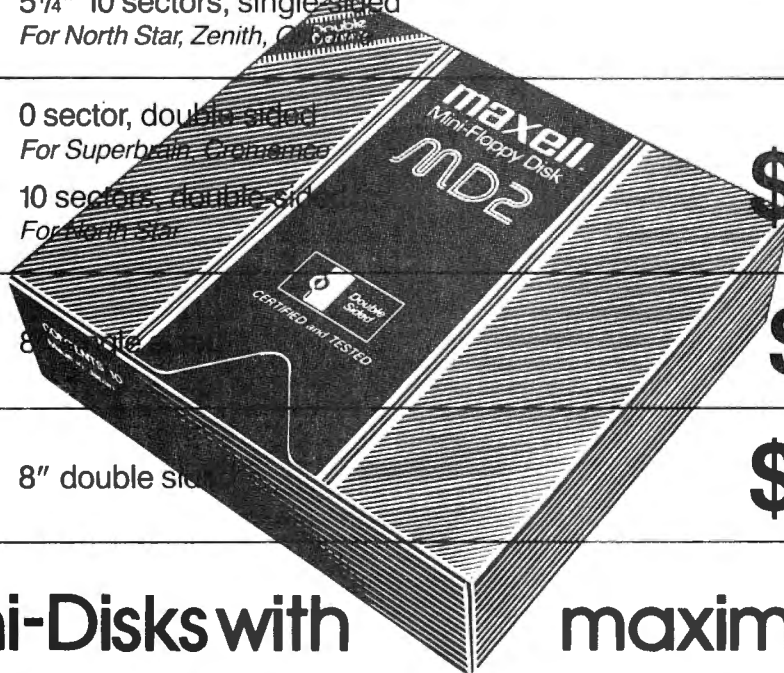
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322	188, 189	287	39	66	381	433	334
392	264-271	591	345	370	195	411	316
9	351	323	100	64	319	590	75
204	21	331	100	586	87	312	155
10	259	369	376	207	324	373	351
52	248	193	369	* Percom Data Co.	32, 33	482	263
		405	369			166	106

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A. What is your occupation?

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- Engineer
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- Student
- Other

B. What are your primary interests in applications of your TRS-80? Rate all that apply on a scale of 1 (least) to 5 (most).

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- Education
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- Other

C. Is your computer use:

- Connected with your occupation
- Not connected with your occupation
- Both of the above apply

D. What type of TRS-80 do you own?

- Model I Level I
- Model I Level II
- Model II
- Model III Level I
- Model III Level II
- Color
- Pocket Computer

E. On average, how many of each issue's program listings do you actually type into your microcomputer?

- 0-2
- 3-5
- 6-8
- 9 or more

F. Are you currently a member of a network?

- Yes Which one? _____
- No

G. To what types of software users groups do you belong?

- Hardware Exclusive
- General Club
- College Organization
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H. From what companies have you purchased software?

- Hayden
- Hewlett-Packard
- Instant Software
- Microsoft
- Personal Software
- SAMS
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Month _____ Page Number _____

L. On a scale of 0 (no interest) to 5 (great interest) please rate your interest in the following columns:

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- Inside 80
- 80 Applications
- Education 80
- News
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- 80 Accountant
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4 9 14 19 24	154 159 164 169 174	304 309 314 319 324	454 459 464 469 474
5 10 15 20 25	155 160 165 170 175	305 310 315 320 325	455 460 465 470 475
26 31 36 41 46	176 181 186 191 196	326 331 336 341 346	476 481 486 491 496
27 32 37 42 47	177 182 187 192 197	327 332 337 342 347	477 482 487 492 497
28 33 38 43 48	178 183 188 193 198	328 333 338 343 348	478 483 488 493 498
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30 35 40 45 50	180 185 190 195 200	330 335 340 345 350	480 485 490 495 500
51 56 61 66 71	201 206 211 216 221	351 356 361 366 371	501 506 511 516 521
52 57 62 67 72	202 207 212 217 222	352 357 362 367 372	502 507 512 517 522
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54 59 64 69 74	204 209 214 219 224	354 359 364 369 374	504 509 514 519 524
55 60 65 70 75	205 210 215 220 225	355 360 365 370 375	505 510 515 520 525
76 81 86 91 96	226 231 236 241 246	376 381 386 391 396	526 531 536 541 546
77 82 87 92 97	227 232 237 242 247	377 382 387 392 397	527 532 537 542 547
78 83 88 93 98	228 233 238 243 248	378 383 388 393 398	528 533 538 543 548
79 84 89 94 99	229 234 239 244 249	379 384 389 394 399	529 534 539 544 549
80 85 90 95 100	230 235 240 245 250	380 385 390 395 400	530 535 540 545 550
101 106 111 116 121	251 256 261 266 271	401 406 411 416 421	551 556 561 566 571
102 107 112 117 122	252 257 262 267 272	402 407 412 417 422	552 557 562 567 572
103 108 113 118 123	253 258 263 268 273	403 408 413 418 423	553 558 563 568 573
104 109 114 119 124	254 259 264 269 274	404 409 414 419 424	554 559 564 569 574
105 110 115 120 125	255 260 265 270 275	405 410 415 420 425	555 560 565 570 575
126 131 136 141 146	276 281 286 291 296	426 431 436 441 446	576 581 586 591 596
127 132 137 142 147	277 282 287 292 297	427 432 437 442 447	577 582 587 592 597
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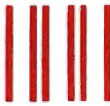
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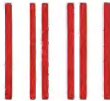
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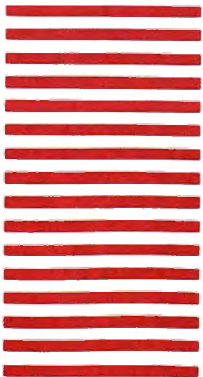
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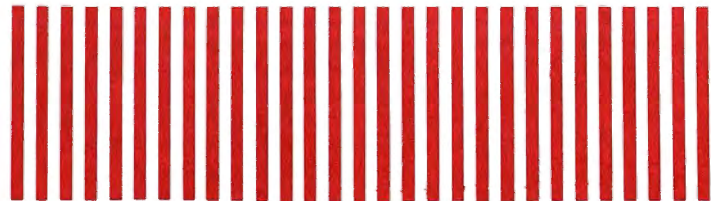


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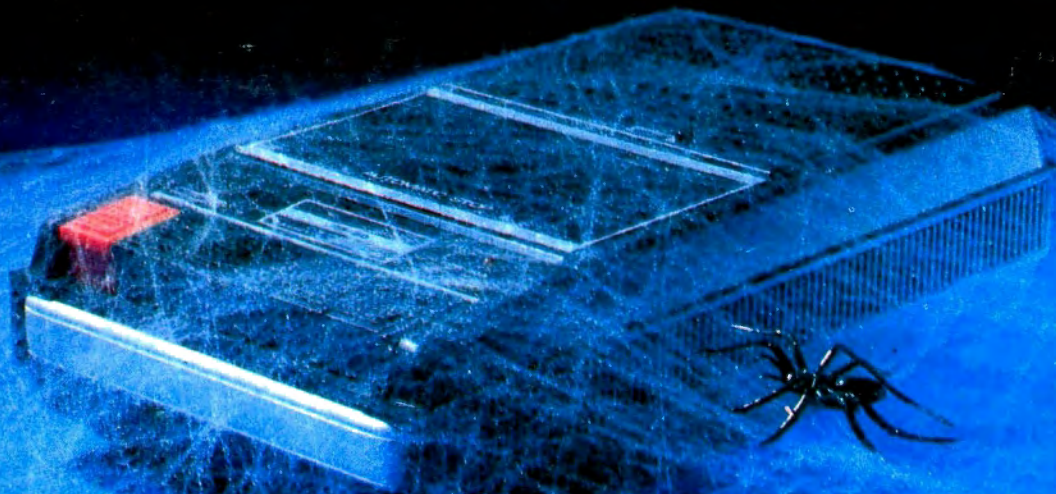
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